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Recreation use of the New Forest
SAC/SPA/Ramsar:

Impacts of recreation and potential
mitigation approaches

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Summary

This report summarises the European site interest features for the New Forest's internationally designated conservation sites which are the New Forest Special Protection Area (SPA), the New Forest Special Area of Conservation (SAC) and the New Forest Ramsar site. It considers the impacts of recreation on these features and the potential for mitigation. The report has been commissioned by Test Valley Borough Council on behalf of a partnership which also includes Eastleigh Borough Council, New Forest District Council, The New Forest National Park Authority, Southampton City Council and Wiltshire Council.

There are many benefits of recreation, including health and well-being and connectedness to nature. However, there are also potential impacts on the environment. These can be summarised under the following broad headings:

- Disturbance (avoidance of breeding habitat, physiological impacts, reduced breeding success);
- Fire (resulting in direct mortality, removal of breeding habitat, long term changes to vegetation structure);
- Contamination (including litter; nutrient enrichment through dog fouling; pollution from dogs entering water courses; spread of alien species and pathogens; greywater from campervans, etc);
- Trampling/wear (soil compaction, erosion, direct damage to breeding or wintering sites, expansion of path networks, churning up sediment in water bodies);
- Harvesting (e.g. collection of wood, fungi);
- Grazing issues (impacts on grazing animals, e.g. from feeding, worrying by dogs, open gates, road traffic accidents)
- Visitor expectation including pressure for facilities and public perceptions of management resulting in difficulties achieving necessary habitat and species protection.

Issues associated with recreation in the New Forest have long been a cause for concern, and some Local Planning Authorities have implemented detailed mitigation strategies. However, the challenge to balance recreation provision with conservation management and protection of the European site interest continues to grow. Increases in housing around the SAC/SPA/Ramsar site in the coming years will exacerbate the issues and result in a marked increase in use. The pressure is particularly around the periphery of the SAC/SPA/Ramsar site.

Working with the steering group, we have listed and reviewed a range of mitigation options. These are aligned with some of the strategic actions identified in the recent update to the New Forest National Park Recreation Management Strategy 2010-2030. The options fall under the following broad headings:

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

- Alternative recreational greenspace sites and routes outside the New Forest SAC/SPA/Ramsar;
- Access management within the New Forest SAC/SPA/Ramsar;
- Educational and communications activities, both within and outside the New Forest SAC/SPA/Ramsar;
- Monitoring; and
- Other (siting of development to avoid/reduce impacts).

Together, the measures identified could form a 'package' of avoidance and mitigation measures that should resolve the cumulative impacts from recreation associated with housing growth around the New Forest. Such a package should enable Local Authorities to be able to rule out adverse effects on integrity to the New Forest SAC/SPA/Ramsar as a result of increased recreation associated with Local Plans. The measures will however not necessarily be easy to establish and will require significant impetus to achieve. Given the broad geographic scope and need for measures to dovetail, it will be important that there is a strategic, proportionate and co-ordinated approach, which will require partnership working across a range of local authorities and stakeholders.

The alignment with the update to the Recreation Management Strategy is important as mitigation measures to resolve impacts from new housing will need to fit with existing recreation management approaches and intended future management within the New Forest; indeed, one of the strategic actions in the Strategy is to 'Develop a coordinated approach among planning authorities in and around the New Forest to mitigate the impacts of new housing on protected areas'. The mitigation measures will however represent a legal obligation by which local planning authorities ensure compliance with the relevant legislation.

Contents

Summary	ii
Contents.....	iv
Acknowledgements	v
1. Introduction	6
Overview	6
Relevant legislation	6
The New Forest SAC/SPA/Ramsar	7
Housing growth and recreation impacts.....	7
Aims of this work.....	8
Other reports	9
2. New Forest SPA, SAC and Ramsar interest features and distributions.....	10
SPA features	10
<i>Heathland breeding species.....</i>	<i>10</i>
<i>Breeding raptors</i>	<i>13</i>
<i>Hen Harrier</i>	<i>13</i>
<i>Wood Warbler.....</i>	<i>13</i>
<i>Breeding waders.....</i>	<i>16</i>
SAC features.....	18
<i>SAC habitats</i>	<i>18</i>
<i>SAC species.....</i>	<i>23</i>
Ramsar features.....	26
<i>Species</i>	<i>26</i>
3. Potential impacts of recreation	28
Impact pathways	28
Disturbance	31
<i>General principles</i>	<i>31</i>
<i>Impacts</i>	<i>31</i>
<i>Types of access</i>	<i>32</i>
<i>Identifying vulnerable species.....</i>	<i>33</i>
Fire	35
Contamination.....	35
Trampling.....	38
Grazing issues	41
Harvesting	44
Perceptions.....	45
Overview of different impacts	46
Condition and general evidence for impacts.....	50
4. Mitigation	52
Background	52
<i>Legislative context.....</i>	<i>52</i>

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

<i>Wider context</i>	53
<i>Existing recreation management measures and HRA findings</i>	54
<i>Benefits of a strategic approach</i>	55
Our approach to identifying possible approaches to mitigation	56
Alternative recreational greenspace sites and routes outside the New Forest SAC/SPA/Ramsar.	58
<i>Insights from the survey results</i>	59
Access management within the New Forest SAC/SPA/Ramsar	63
<i>Insights from the survey results</i>	64
Educational and communications activities, both within and outside the New Forest	
SAC/SPA/Ramsar	73
<i>Insights from the survey results</i>	74
Other Measures: distribution of housing	75
<i>Insights from the survey results</i>	75
Monitoring	76
Summary of mitigation options	77
5. References	84
Appendix 1: Selected SSSI condition commentary	92

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1. Introduction

Overview

- 1.1 This report, commissioned by a partnership of local authorities with funding from central government, is part of a series that relates to understanding the impacts of recreation (arising from new housing development) on the New Forest international nature conservation designations. The various studies are intended to inform necessary mitigation approaches.
- 1.2 In this report we summarise information on the interest features of the relevant conservation designations, consider the potential impacts of recreation and consider the potential options for avoidance and mitigation.

Relevant legislation

- 1.3 The designation, protection and restoration of key wildlife sites is embedded in the Conservation of Habitats and Species Regulations 2017 (as amended), which are commonly referred to as the 'Habitats Regulations.' These Regulations are in place to transpose European legislation set out within the Habitats Directive (Council Directive 92/43/EEC), which affords protection to plants, animals and habitats that are rare or vulnerable in a European context, and the Birds Directive (Council Directive 2009/147/EC), which originally came into force in 1979, and which protects rare and vulnerable birds and their habitats. These key pieces of European legislation seek to protect, conserve and restore habitats and species that are of utmost conservation importance and concern across Europe. European sites include Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) classified under the Birds Directive. Ramsar sites, those wetlands of international importance that are listed in the Ramsar Convention are, through government policy, are also treated as European sites.
- 1.4 Public bodies, including local planning authorities, have specific duties in terms of avoiding deterioration of habitats and species for which sites are designated or classified, and stringent tests have to be met before plans and projects can be permitted. Importantly, the combined effects of individual plans or projects must be taken into account. For local planning authorities, this means that the combined effect of individual development proposals needs to be assessed collectively for their cumulative impact, as well as on an individual basis.

The New Forest SAC/SPA/Ramsar

- 1.5 The New Forest is one of the largest tracts of semi natural vegetation in the country, and as such is one of our most important wildlife sites. The area hosts three international wildlife site designations and is closely located to other international wildlife sites such as the Solent and Southampton Water.
- 1.6 The New Forest is classified as an SPA for its breeding and overwintering bird species of European importance, in accordance with the European Birds Directive. The designation relates to internationally significant breeding populations of Dartford Warbler *Sylvia undata*, Nightjar *Caprimulgus europaeus*, Woodlark *Lullula arborea*, Honey Buzzard *Pernis apivorus*, Hobby *Falco subbuteo* and Wood Warbler *Phylloscopus sibilatrix* and over-wintering Hen Harrier *Circus cyaneus*.
- 1.7 The New Forest is also designated as an SAC for its habitats and non-avian species of European importance, in accordance with the European Habitats Directive. This designation reflects the unique mosaic of habitats across the New Forest, which includes eight Annex 1 heathland, grassland, woodland, wetland, bog and open water habitats, together with three Annex 2 species, Stag Beetle *Lucanus cervus*, and Southern Damselfly *Coenagrion mercuriale*, and Great Crested Newt *Triturus cristatus*.
- 1.8 Also relevant is the New Forest's listing as a Ramsar site, under the Ramsar Convention. This recognises the international importance of the site as a wetland, supporting wetland flora and fauna of international importance, and adding to the global network of Ramsar listed wetlands.

Housing growth and recreation impacts

- 1.9 A challenging issue for UK nature conservation is how to respond to increasing demand for access without compromising the integrity of protected wildlife sites. Areas that are important for nature conservation are often important for a range of other services, including the provision of space for recreation for an increasing population. Such recreation space can be used for a wide variety of activities, ranging from the daily dog walks to competitive adventure and endurance sports.
- 1.10 There is now a strong body of evidence showing how increasing levels of access can have negative impacts on wildlife. Visits to the natural environment have shown a significant increase in England as a result of the increase in population and a trend to visit more (O'Neill, 2019). The issues are particularly acute in southern England, where population density is highest. Issues are varied and include disturbance, increased fire risk, contamination and damage (for general

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches
reviews see: Liley et al., 2010; Lowen, Liley, Underhill-Day, & Whitehouse, 2008; Ross et al., 2014; Underhill-Day, 2005).

- 1.11 The issues are not however straightforward. It is now increasingly recognised that access to the countryside is crucial to the long term success of nature conservation projects, for example through enforcing pro-environmental behaviours and a greater respect for the world around us (Richardson, Cormack, McRobert, & Underhill, 2016). Access also brings wider benefits to society that include benefits to mental/physical health (Keniger, Gaston, Irvine, & Fuller, 2013; Lee & Maheswaran, 2011; Pretty et al., 2005) and economic benefits (ICF GHK, 2013; ICRT, 2011; Keniger et al., 2013; The Land Trust, 2018). Nature conservation bodies are trying to encourage people to spend more time outside and government policy is also promoting countryside access in general (e.g. through enhancing coastal access).
- 1.12 There are two statutory purposes for national parks in England and Wales. The first is to conserve and enhance natural beauty, wildlife and cultural heritage and the second is to promote opportunities for the understanding and enjoyment of the special qualities of national parks by the public. This second purpose includes opportunities for open air recreation. However, if it appears that there is a conflict between the two National Park purposes, the Environment Act 1995 requires greater weight to be attached to the purpose of conserving and enhancing the natural beauty, wildlife and cultural heritage of the National Park (this is known as the Sandford Principle¹). When national parks carry out these purposes, they also have the duty to encourage the social and economic well-being of local communities within the national park.
- 1.13 There is therefore, a significant challenge: to avoid or mitigate potential negative impacts associated with recreation so as to comply with legislation without compromising the ability of people to be outside enjoying sites for recreation.

Aims of this work

- 1.14 This report has been commissioned to summarise the European site interest features and review the various pathways and mechanisms by which recreation may impact them. These findings then lead to consideration of the implications in terms of mitigation or avoidance measures. This provides context for the visitor survey work conducted in parallel (see and will provide the basis for future appropriate assessment and consideration of future approaches to resolve issues associated with recreation pressure from new housing).

¹ Named after Lord Sandford, who chaired the 1974 National Parks Policy Review Committee.

Other reports

1.15 The work forms part of a series of reports that relates to understanding the impacts of new development on the New Forest international nature conservation designations. The project as a whole involves visitor surveys combined with work to understand the impacts of recreation and relevant mitigation approaches. Other reports, produced in parallel with this one, include:

- **Recreation use of the New Forest SAC/SPA/Ramsar: New Forest visitor survey 2018/19** - results of on-site face-face interviews with visitors conducted at formal car parks and other locations across the New Forest SAC/SPA/Ramsar;
- **Recreation use of the New Forest SAC/SPA/Ramsar: New Forest vehicle counts 2018/19** – results of vehicle counts across the New Forest SAC/SPA/Ramsar car parks, counting all parked vehicles on a range of different dates over a year;
- **Recreation use of the New Forest SAC/SPA/Ramsar: Results of a telephone survey with people living within 25km** - the results of a telephone survey with 2,000 residents living within a 25km radius of the woodland/heathland areas of the New Forest SAC/SPA/Ramsar;
- **Recreation use of the New Forest SAC/SPA/Ramsar: Overview of visitor results and implications of housing change on visitor numbers** - a summary of the visitor survey results, drawing the findings from the telephone survey, on-site survey and vehicle counts together and making predictions for change in recreation as a result of new housing.

2. New Forest SPA, SAC and Ramsar interest features and distributions

SPA features

- 2.1 The SPA qualified for designation under Article 4.1 of the Birds Directive as it is used regularly by 1% or more of the Great Britain population of three heathland species (Dartford Warbler *Sylvia undata*, Woodlark *Lullula arborea* and Nightjar *Caprimulgus europaeus*) and Honey Buzzard *Pernis apivorus* (all breeding) and Hen Harrier *Circus cyaneus* (wintering). The SPA also qualifies under Article 4.2 for breeding Hobby *Falco subbuteo* and Wood Warbler *Phylloscopus sibilatrix*. While not qualifying species, the SPA citation also highlights the notable populations of breeding waders and breeding Redstart *Phoenicurus phoenicurus*.

Heathland breeding species

- 2.2 At the time of classification (in 1992), the SPA supported 300 Nightjar territories (estimated to be at least 15% of the UK population at the time); 51-54 pairs of Woodlarks (24% of the UK population) and 454 pairs of Dartford Warblers (75% of the UK population).
- 2.3 Bird counts over time are summarised by the National Park Authority (2016) and recent surveys (undertaken by the Hampshire Ornithological Society HOS) have been commissioned by the Verderers as part of the Higher Level Stewardship Agreement. Plots showing changes in bird numbers for the three species over time are shown in Figure 1, and Map 1 shows recent distribution (occupied km squares). These counts indicate that numbers of all three species have previously been higher and in the case of Nightjar and Dartford Warbler, a decline is evident.
- 2.4 The 2018 survey (Jackson, 2018) showed a decline in the number of Nightjar compared to 2004/5 and to 2013, with a reduction in the number of territories across the whole of the New Forest. The results from the 2018 survey of Dartford Warblers (Clements, 2019) suggests numbers were at an all-time low, albeit after two spells of severe cold weather late in the winter. However, the data for population changes for these three species do not mirror those of nearby Dorset heathland sites (Liley & Fearnley, 2014; Panter & Caals, in prep). For example, Dartford Warbler numbers remained broadly stable over the period 1990 -2009 across the Dorset Heaths as a whole (Liley & Fearnley, 2014) and Nightjar numbers have increased at multiple sites in recent years (Panter & Caals, in prep).

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

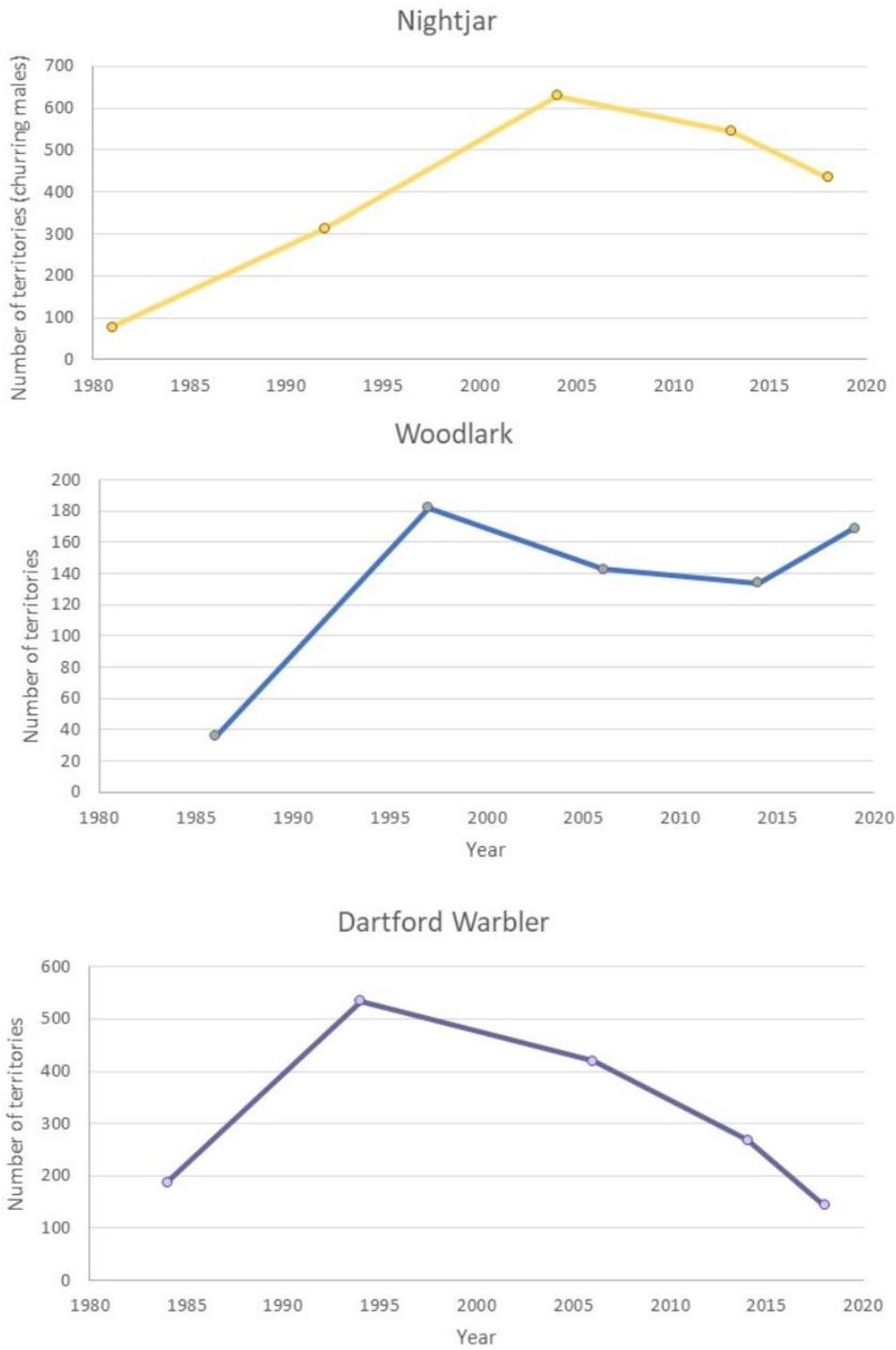
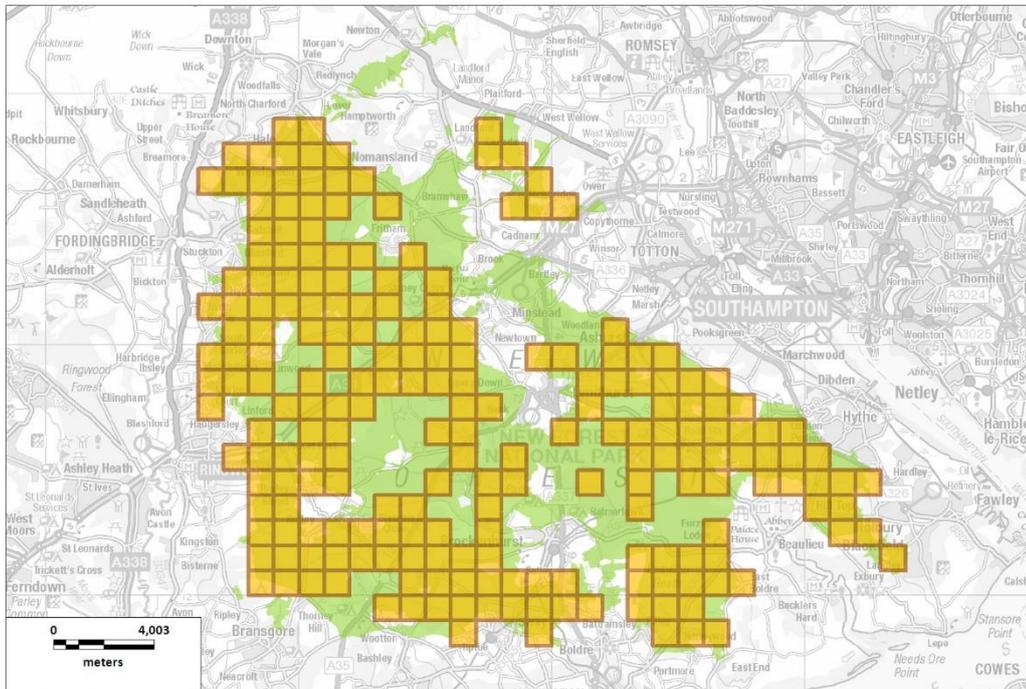


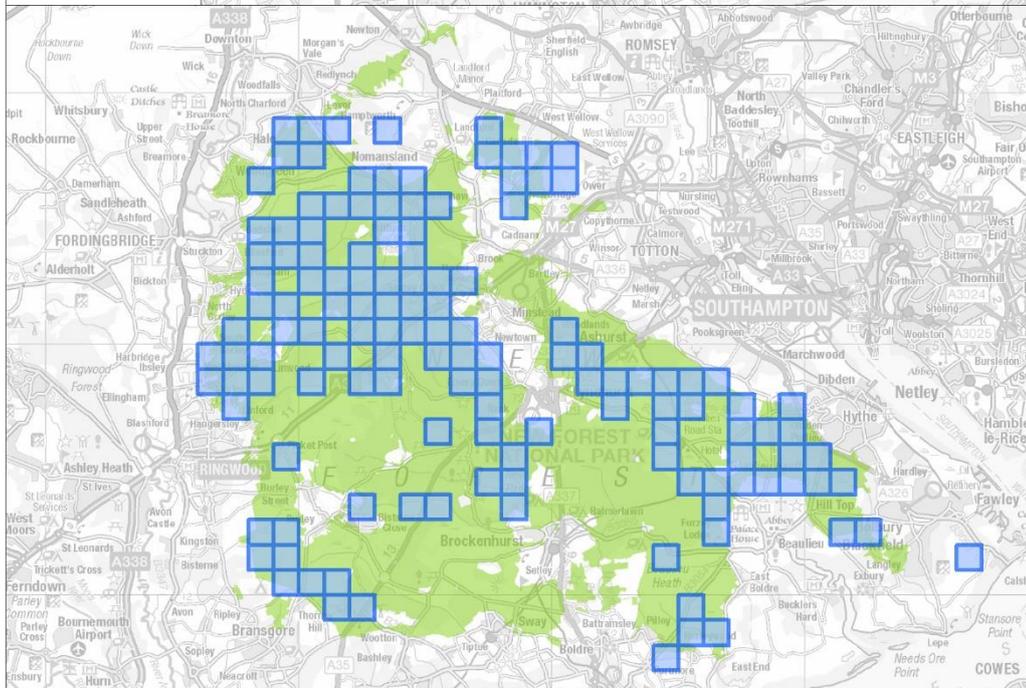
Figure 1: Summary of bird numbers over time. Drawn from New Forest NPA (New Forest NPA 2016) and more recent surveys (e.g. Jackson, 2018 and HOS surveys in 2019).

Map 1: Heathland birds (1km grid cells)

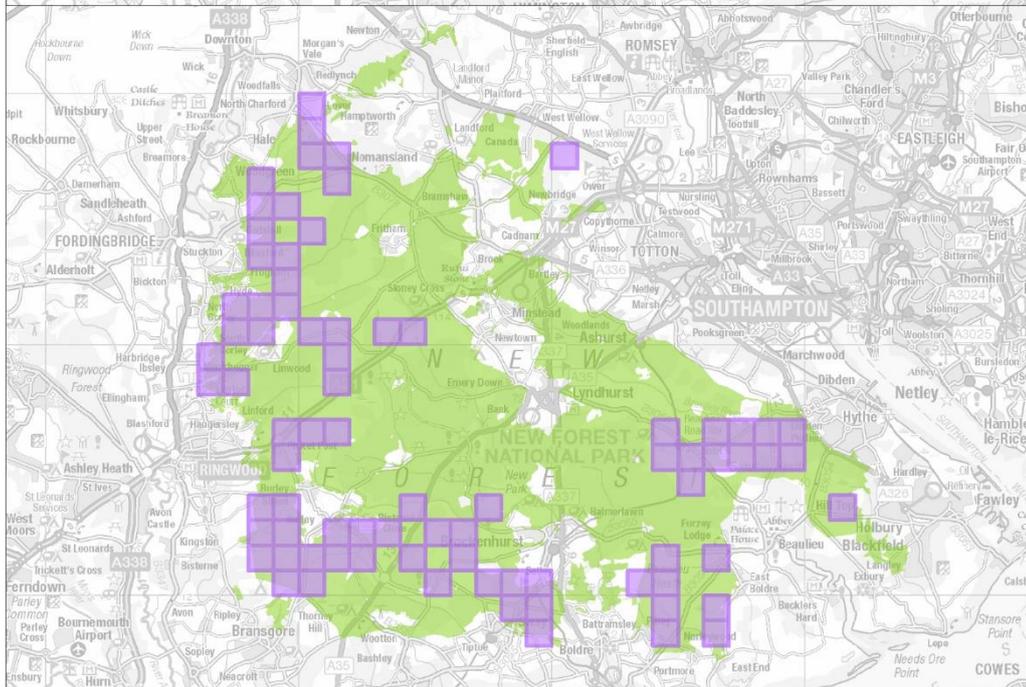
Nightjar 2018

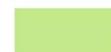


Woodlark 2019



Dartford Warbler 2018



 New Forest SPA/SAC

Breeding raptors

- 2.5 Both Honey Buzzard and Hobby have exhibited large national range expansions and population increases (the latter +144% and +133%, respectively) over the 25 years up to 2016 (Holling & Rare Breeding Birds Panel, 2018), with the New Forest comprising a key site historically for both species. The Honey Buzzard population within the New Forest SAC/SPA/Ramsar has remained stable (or possibly slightly increased) since the classification of the SPA (at classification the site supported 2 pairs, around 7% of the UK population), with high levels of productivity also recorded (Hampshire Ornithological Society, 2015a). There were thought to be 4-5 pairs in 2019 (Betton *pers. comm.*).
- 2.6 Contrastingly, and despite having a sizeable and healthy population across Hampshire as a whole, there are indications of a decline in the New Forest Hobby population (Hampshire Ornithological Society, 2015a), potentially linked to changes in prey availability and colonisation by predatory Goshawk *Accipiter gentilis*. At classification the SPA was estimated to support 25 pairs of Hobby (3% of the UK population), while the conservation objectives (supplementary advice) suggests a total of just 6 pairs in 2016². More recently the breeding totals are perhaps around 4 pairs (Hampshire Ornithological Society, 2018).

Hen Harrier

- 2.7 Hen Harriers are only present within the New Forest SAC/SPA/Ramsar as winter visitors, during which the species uses communal roosts at traditional localities. The winter distribution of the species across Hampshire as a whole has increased in recent decades, although the number of individuals recorded has continued to decline (Hampshire Ornithological Society, 2015a) and numbers using the New Forest SAC/SPA/Ramsar during the winter are now very low, with just lone birds recorded in recent winters (Keith Betton *pers. comm.*). There has been a continuing downward annual trend in the number of wintering individuals between 2013 and 2015 (Hampshire Ornithological Society, 2015b, 2015c, 2016). The New Forest however still has the greatest density of records of this scarce and declining winter visitor within the county (Hampshire Ornithological Society, 2015a).

Wood Warbler

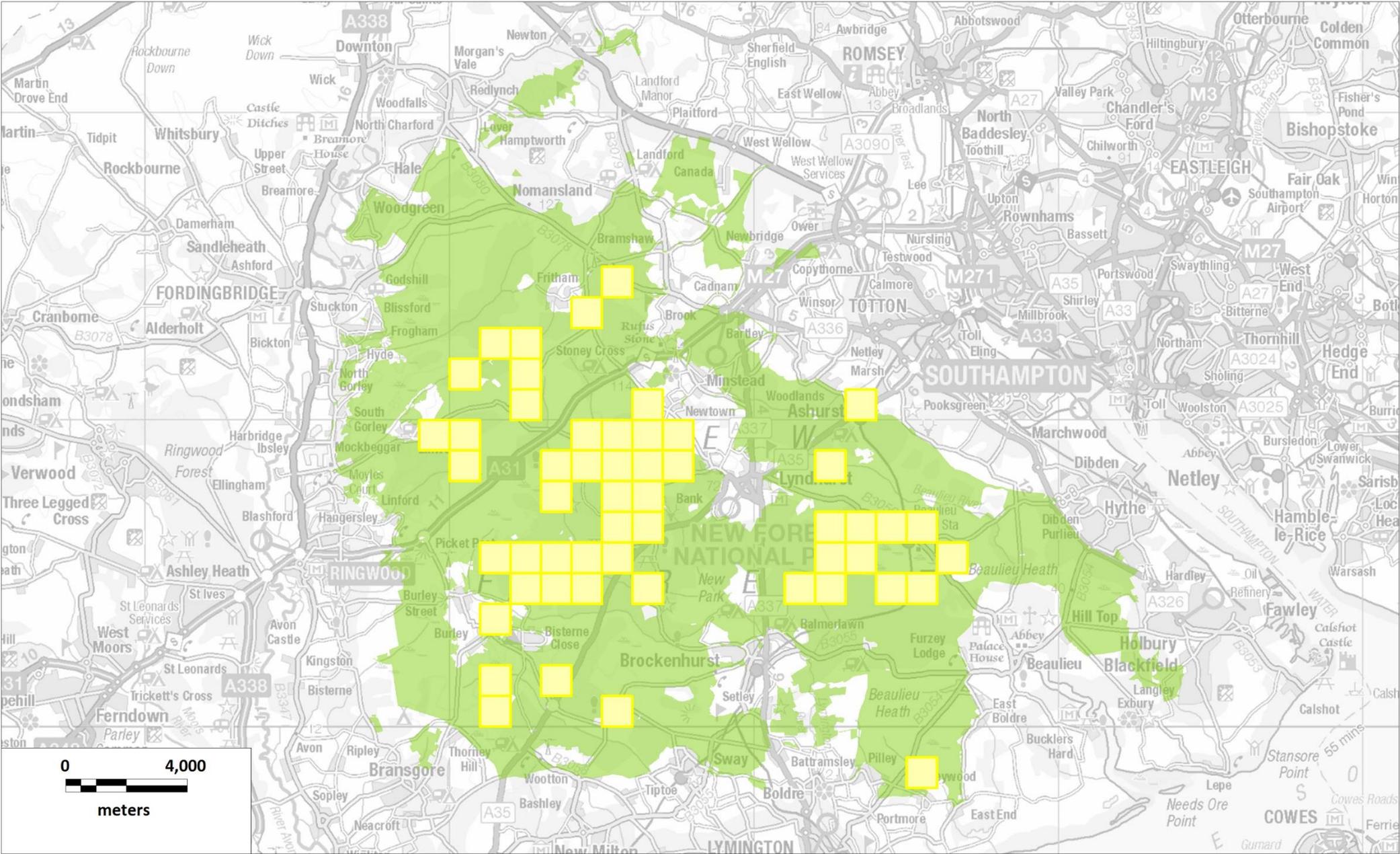
- 2.8 Within Hampshire, breeding Wood Warbler is now confined to the New Forest (Hampshire Ornithological Society, 2015a), with the breeding range of the species within the county declining by 76% between 1986 - 1991 and 2007 - 2012.

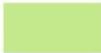
² Natural England: [European Site Conservation Objectives: Supplementary advice on conserving and restoring site features - New Forest Special Protection Area \(SPA\) Site code: UK9011031](#)

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

Numbers within the New Forest itself have continued to decrease, in line with a well-documented national range contraction and population decline (Balmer et al., 2013) and the species is in real danger of becoming extinct as a breeding species within the next few years within the New Forest (T. Davis, *pers comm.*). Comparison of breeding populations in Wales (a relatively stable population), Devon (a declining population) and the New Forest (declining population) found high rates of nest predation for the New Forest, but not at the Devon site (P. Bellamy, 2015; P. E. Bellamy et al., 2018). There is a suggestion that demographics in other parts of their breeding range or in their wintering areas are likely reasons for local population declines (P. Bellamy, 2015; Mallord, Smith, Bellamy, Charman, & Gregory, 2016).

Map 2: Wood Warbler occupied grid cells (2016 - 2018)



 New Forest SPA/SAC

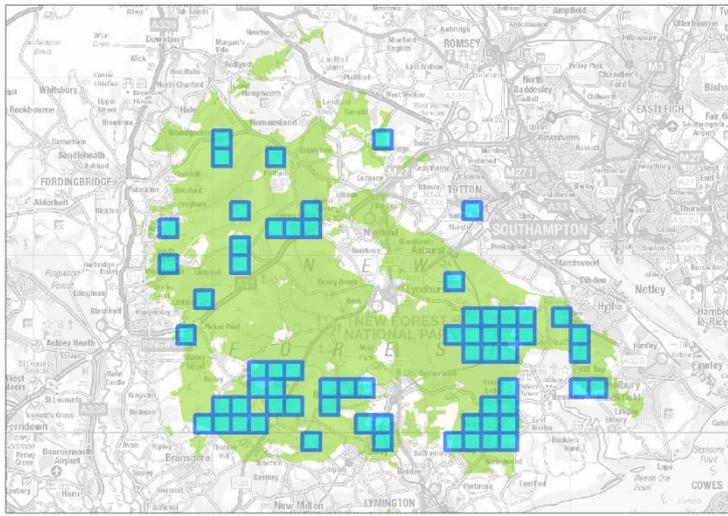
 1km cells with territories, 2016-2018.

Contains Ordnance Survey Data. © Crown Copyright and Database Right 2019. Designated site boundaries downloaded from Natural England website. © Natural England. Bird data provided by Hampshire Ornithological Society.

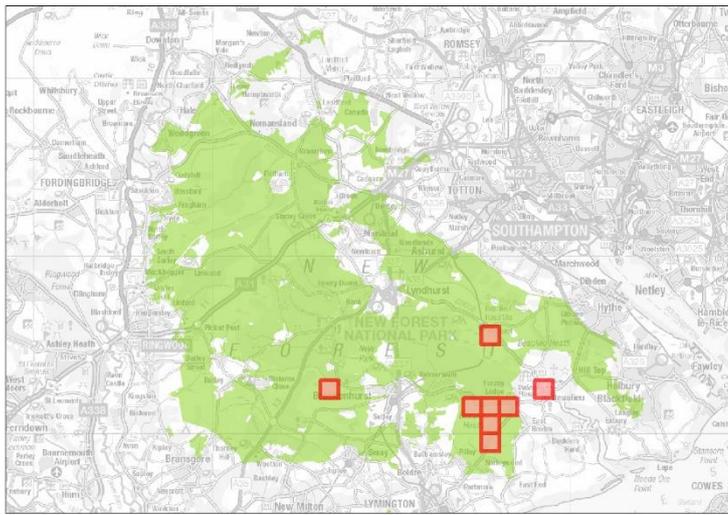
Breeding waders

- 2.9 Breeding waders are not an interest feature of the SPA but are mentioned in the SPA citation. They are a distinctive and notable feature of the New Forest. Key species are Lapwing *Vanellus vanellus*, Snipe *Gallinago gallinago*, Curlew *Numenius arquata* and Redshank *Tringa totanus*. There have been very marked declines over the last two decades and possibly longer (e.g. Goater, Houghton, & Temple, 2004; HOS, 2019; Wyn & Page, 2018). Recent estimates for the New Forest for 2019 (HOS, 2019) are for around 40 pairs of Curlew, 48 pairs of Lapwing and just 7 Redshank territories. The most recent data for Snipe were 102 drumming males in 2014 (RPS, 2014). Recent distribution data from the period 2016-18, provided by the Hampshire Ornithological Society are summarised in Map 3.

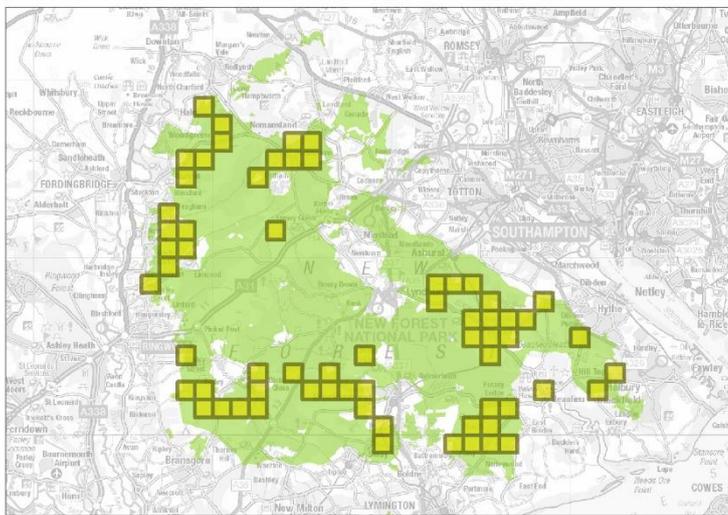
Map 3: Breeding waders (1km grid cells with occupied territories)



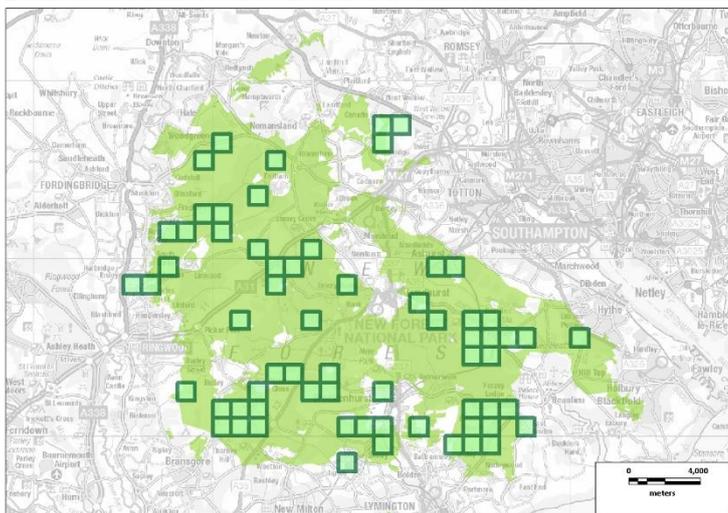
Lapwing 2016-2018



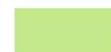
Redshank 2016-2018



Curlew 2016-2018



Snipe 2016-2018

 New Forest SPA/SAC

SAC features

SAC habitats

- 2.10 The New Forest SAC is unique in the extent and natural dynamism of its semi-natural habitats. It is characterised by a fluctuating mosaic of habitat types that were once common across lowland western Europe but are now generally highly fragmented. Woodlands include ancient wood pasture, inclosure woodland and smaller areas of riverine woodland and bog woodland. Heathlands comprise extensive dry and wet heaths intersected by valley mires and streams with pools, temporary ponds and dry and wet grassland. Thirteen Annex I habitats are represented, included two priority habitats. Veteran trees and dead wood mean the New Forest SAC is of exceptional importance for its saprophytic invertebrate fauna and lichen and bryophyte flora while the heathlands, grasslands and wetlands support vegetation communities and species reflective of the long continuous history of livestock grazing. Habitats are listed and described in Table 1. Map 4 shows the habitat data.

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

Table 1: Habitats for which the New Forest SAC is designated. Descriptions and areas are based on those given in Wright & Westerhoff (2001)

Habitat	Area (ha)	Notes
91D0 Bog woodland ³	33	Birch – willow <i>Betula – Salix</i> stands over valley mire vegetation, with fringing alder <i>Alnus – Sphagnum</i> stands where there is some water movement. Rich epiphytic lichen communities and the pollen record suggest these have persisted for long time periods in stable association with the underlying bog-moss communities. There is around 215ha of more recent willow carr on the headwaters of mires that is not referable to this Annex I habitat.
H91E0 Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> ⁴	212	Many New Forest streams are less modified than those in most areas of lowland England and show natural meanders and debris dams. Associated with those with alkaline and neutral groundwater are strips of Alder <i>Alnus glutinosa</i> woodland and transitions from open water through reedswamp and fen to Alder woodland plus fragmentary Ash <i>Fraxinus excelsior</i> stands. There are transitions to other Annex I woodland types
H9120 Atlantic acidophilous beech forests with <i>Ilex</i> and sometimes also <i>Taxus</i> in the shrublayer (<i>Quercion roburipetraeae</i> or <i>Illici-Fagenion</i>)	2000	Largest area of mature, semi-natural Beech <i>Fagus sylvatica</i> woodland in Britain. Much of this is open wood pasture with a varied age structure from saplings to standing dead and fallen wood and has a higher proportion of veteran trees than elsewhere in Europe. Mosaics with other woodland types and heathland has allowed unique assemblages of epiphytic lichens and saproxylic invertebrates to be sustained
H9130 <i>Asperulo-Fagetum</i> beech forests	400	Forms a proportion of the New Forest Beech wood (see above) on less acidic soils with Bramble in the understorey
H9190 Old acidophilous oak woods with <i>Quercus robur</i> on sandy plains	120	Most extensive area of active wood-pasture with old oak <i>Quercus</i> spp. (and Beech) in north-west Europe; outstanding invertebrate and lichen populations.
H4030 European dry heaths	7600	Largest area of lowland heathland in UK. Six sub-communities can be separated along a moisture gradient from dry, nutrient poor Heather <i>Calluna vulgaris</i> dominated heath to those too moist to support Bell Heather <i>Erica cinerea</i> but not wet enough to support Cross-leaved Heath <i>Erica tetralix</i>

³ Priority feature

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

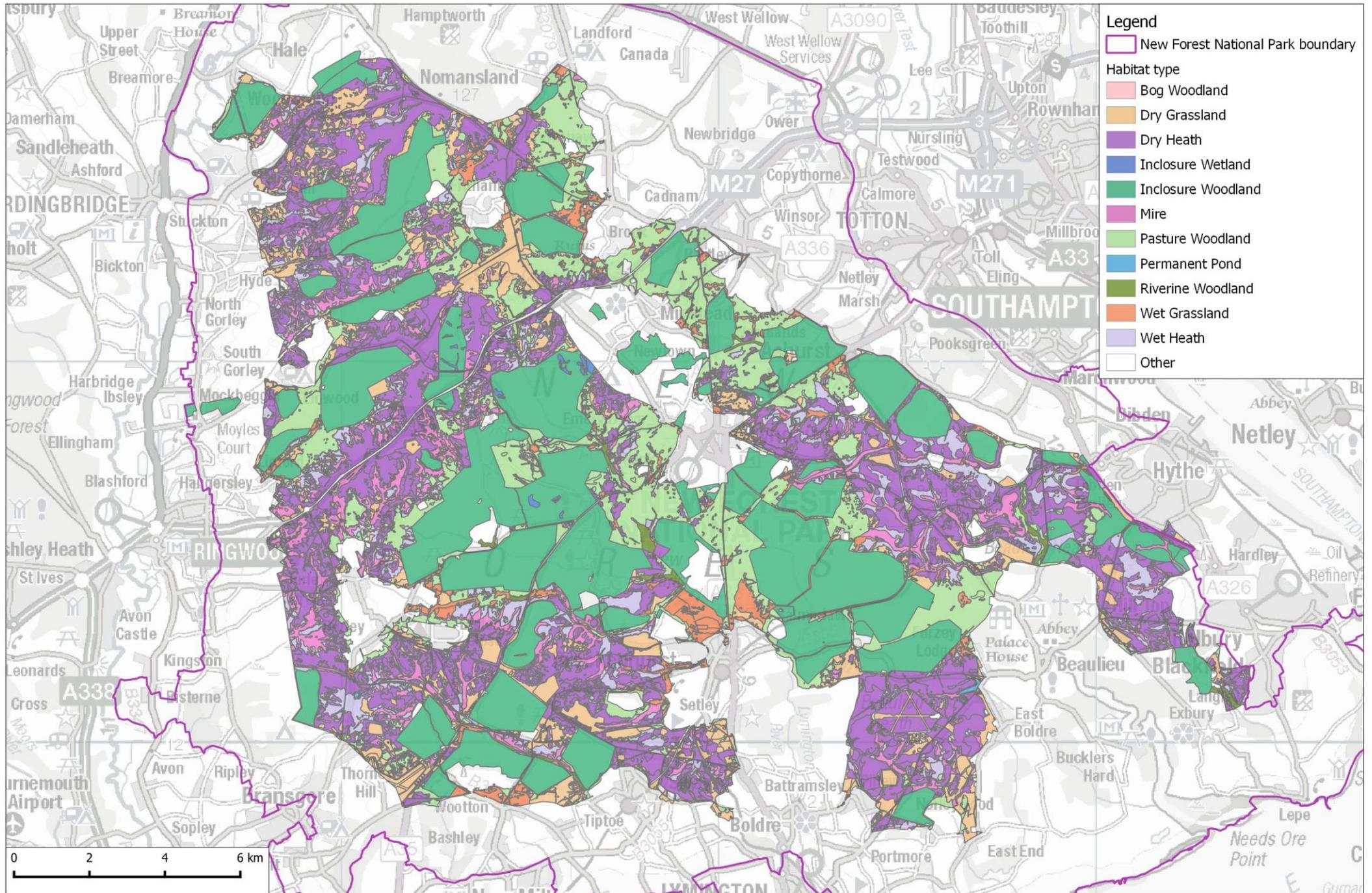
Habitat	Area (ha)	Notes
		and bog-mosses. Due to the clay content of the soils in places, it includes transitional “humid heath” characterised by Heather, Purple Moor-grass and the distinctively domed Pincushion moss <i>Leucobrium glaucum</i> .
H4010 Northern Atlantic wet heaths with <i>Erica tetralix</i>	2100	Most extensive stands Southern England. Found on shallow peat or acidic mineral soils with impeded drainage, two communities are separated along a gradient of soil moisture, nutrient and base status, both are too wet to support Bell Heather but too dry for most peat-building bog-mosses. All are characterised by Heather, Cross-leaved Heath and Purple Moor-grass <i>Molinia caerulea</i> often with Bog Myrtle <i>Myrica gale</i> . Base rich influence is seen in the presence of Devil’s-bit scabious <i>Succisa pratensis</i> and Meadow Thistle <i>Cirsium dissectum</i> . Rare and scarce species include Marsh Gentian <i>Gentiana pneumonanthe</i> , Marsh Clubmoss <i>Lycopodiella inundata</i> Blue-tailed damselfly <i>Ishnura pumilio</i> and Small Red Damselfly <i>Ceriagrion tenellum</i> .
H6410 <i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinia caerulea</i>)	?	In the New Forest this relates to species-rich fen meadows characterised by Purple Moor-grass, Meadow Thistle, Bog Pimpernel <i>Anagallis tenella</i> , Lousewort <i>Pedicularis sylvatica</i> and Devil’s-bit scabious. These fen meadows form one part of a spectrum of wet grasslands found in the New Forest and are found in transitions with wet heath.
H7150 Depressions on peat substrates of the <i>Rhynchosporion</i>	210	Largest area of this habitat type in England. Wet hollows with bare peat support Brown Beak-sedge <i>Rhynchospora fusca</i> with sundews <i>Drosera</i> spp., generally found in complex mosaics in valley mires e.g. around the edges of bog pools, in flushes on the margins of valley mires and in disturbed areas such as wet tracks or old peat diggings.
H7230 Alkaline fens ⁵	?	Marl flushes are found in valley mire seepages and flushes that are influenced by lime-rich clay. The base content of the water is sufficient to support brown mosses rather than bog-mosses and in some cases results in tufa deposits on the moss.
H7140 Transition mires and quaking bogs ⁴	9	In the New Forest, transition mires take the form of marl swamps within valley mires, which are themselves found in shallow valleys with gently sloping water tables and impermeable subsoils. Marl Swamps are confined to areas where base-rich water produces very wet, swampy conditions.

⁴ Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

Habitat	Area (ha)	Notes
H3110 Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>)	?	In well-grazed temporary ponds in the New Forest, two communities fall within this habitat: (i) Common Spike rush <i>Eleocharis palustris</i> - Purple Moor-grass swards, found with carpets of bog-mosses in pans and runnels in wet heath that are not acidic or nutrient poor enough for bog pool communities, and (ii) Lesser Marshwort <i>Apium inundatum</i> – Floating Clubrush <i>Eleogiton fluitans</i> – Pillwort <i>Pilularia globulifera</i> found in less acidic but nutrient poor water in wet grassland, in which the nationally rare Slender Marsh-bedstraw <i>Galium constrictum</i> and Hampshire Purslane <i>Ludwigia palustris</i> are found.
H3130 Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i>	?	Assemblages on the edges of large temporary ponds, shallow ephemeral pools and poached damp hollows in grassland support a community of Toad Rush <i>Juncus bufonius</i> and Coral Necklace <i>Illecebrum verticillatum</i> and Yellow Centaury <i>Cicendia filiformis</i> .

Map 4: Habitats in the New Forest (2007 Forestry Commission survey)



SAC species

- 2.11 Two species on Annex II of the Habitats Directive are primary features of the site: Great Crested Newt is also a qualifying feature of the site, but not a primary reason for its designation.
- 2.12 Stag Beetles require broad-leaved tree stumps, or fallen trees in contact with the ground, within which their larvae can develop over a period of 3 to 4 years. They are the largest, and arguably the most spectacular, of the terrestrial British Coleoptera, and the New Forest SAC comprises a key stronghold for the species within the UK (and forms a core unit within the species' main Hampshire/Sussex population centre). The New Forest SAC as a whole has been recognised for its importance to saproxylic invertebrate species, including species such as the Stag Beetle. A summary of the species' distribution across the New Forest (data from 1999 onwards) are shown in Map 5.
- 2.13 Great Crested Newts are present in a large number of ponds, primarily distributed around the perimeter of the New Forest SAC. The species uses these freshwater habitats during the breeding season, with eggs laid amongst aquatic vegetation in the early spring and the resulting juveniles emerging from the breeding ponds in late summer/early autumn, following an aquatic development phase. Both adult and juvenile newts spend extended periods living and foraging within terrestrial environments, and the availability of suitable terrestrial habitat (as well as breeding sites) is therefore of key importance for the species.
- 2.14 Southern Damselflies are widespread across the New Forest SAC, which is the major population centre for the species in Britain, with nearly 20 populations and 1,800 males recorded in 2015/16 (Panter, Lake & Liley 2016). Distribution data (from Panter, Lake & Liley) are summarised in Map 5. It is found in shallow, well-vegetated, base-rich funnels and flushes with gently flowing, well-oxygenated water on wet heaths or in valley mires. Females lay eggs on submerged plants and the larvae, which remain in the runnels, and take two years to mature. The species is therefore susceptible to drought, freezing and deterioration in water quality. The UK population is thought to be a major European stronghold of the species.

Table 2: Species for which the New Forest SAC is designated.

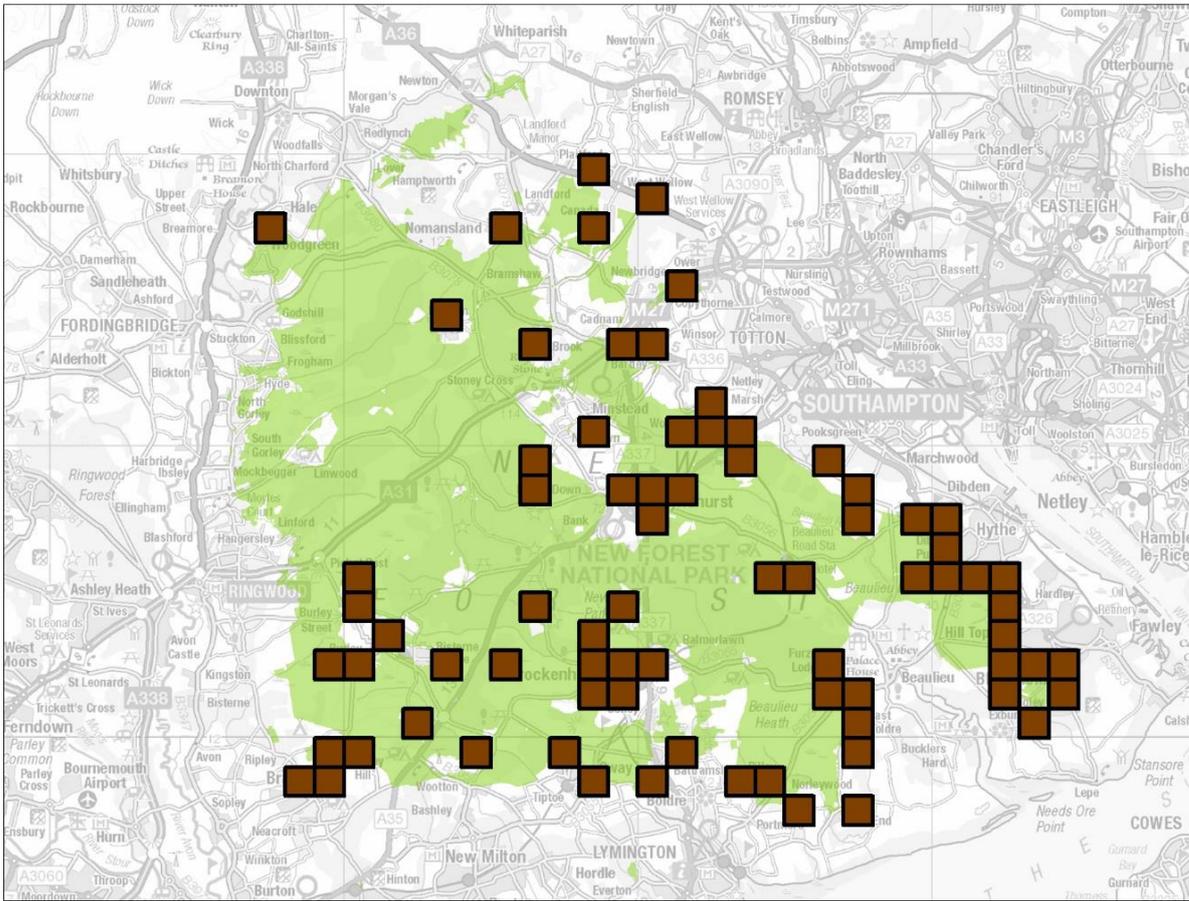
Species	Population size and distribution	Notes
1044 Southern damselfly <i>Coenagrion mercuriale</i>	1765 males (2015), at least 18 sites across S & W of New Forest SAC. Largest population in England	Confined to shallow, well-vegetated bases-rich runnels in a heathland context. Poor dispersal. Apparent 3x increase between 2004 & 2015 surveys
1083 Stag beetle <i>Lucanus cervus</i>	Major stronghold. Relatively widespread and abundant.	Larvae inhabit rotting wood such as tree stumps and fallen dead trees in contact with the ground within broad-leaved woodland in open, unenclosed woodland. Records are from urban fringes – may partly reflect ongoing citizen science project ⁵
Great-crested Newt <i>Triturus cristatus</i> ⁶	1,000 to 10,000 individuals	Mostly found in slightly more nutrient-rich, less acidic ponds in fringes of New Forest SAC

⁵ <https://ptes.org/press-release-stag-beetles/>

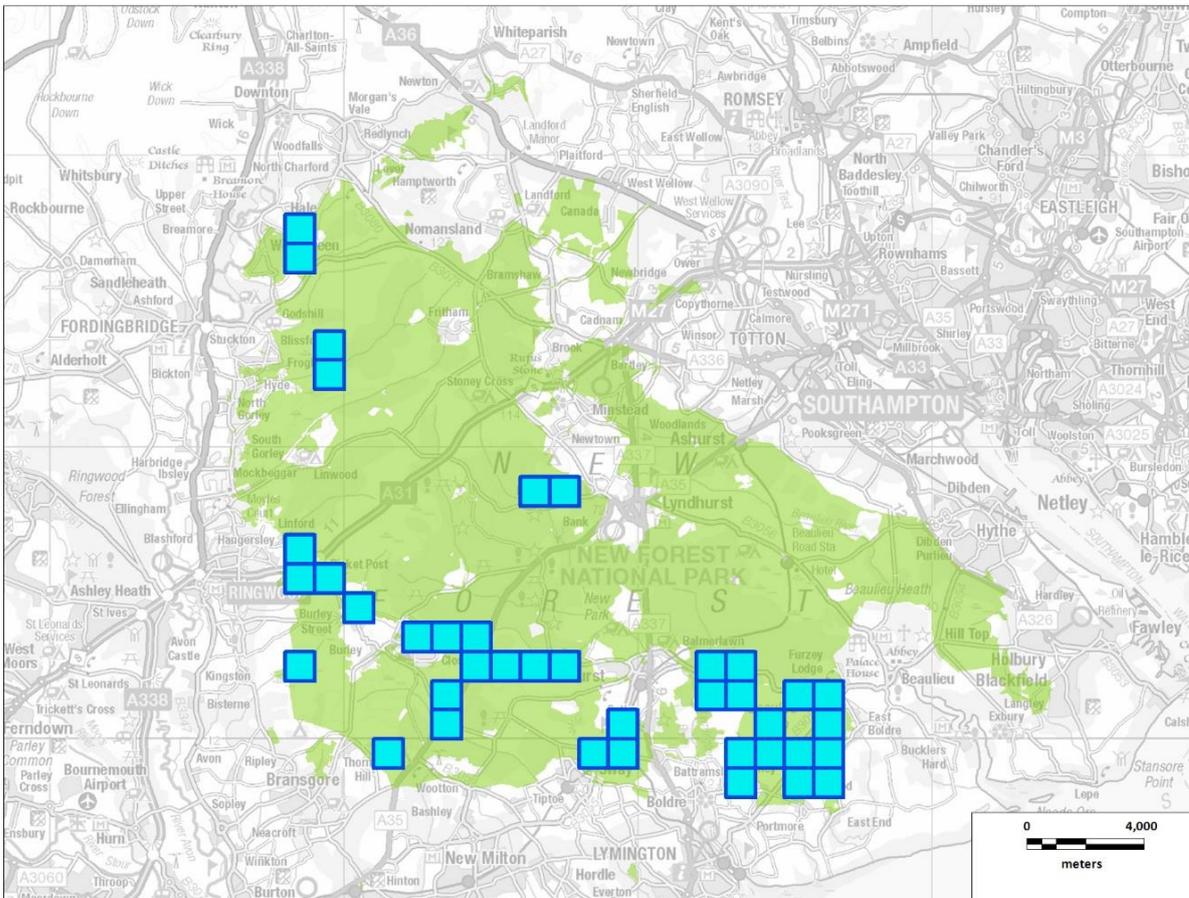
⁶ Qualifying features that are not primary reasons for selection

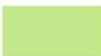
Map 5: Stag Beetle and Southern Damselfly distribution, 1km grid cells

Stag Beetle
1999-present



S. Damselfly



 New Forest SPA/SAC

Contains Ordnance Survey Data. © Crown Copyright and Database Right 2019.
 Designated site boundaries downloaded from Natural England website. © Natural England.
 Stag Beetle data from NBN Atlas occurrence download at <http://nbnatlas.org>. Accessed 20th October 2019. PTES data.
 Southern Damselfly data from Panter et al. 2016.

Ramsar features

- 2.15 The New Forest Ramsar site is described as complex, with examples of semi-natural habitats essential to the genetic and ecological diversity of southern England.
- 2.16 Habitat features of the New Forest Ramsar overlap with the SAC (see Table 1) and are therefore not described again here.

Species

- 2.17 Overlap between SPA, SAC and Ramsar site designated features include the nationally important breeding population of Dartford Warbler and wintering population of Hen Harrier, and internationally important populations of both Southern Damselfly and Stag Beetle (see SPA and SAC information above). Additional nationally important species recorded from the site include Great Crested Newt, Bullhead *Cottus gobio*, and Brook Lamprey *Lampetra planeri*.
- 2.18 The site is of particular importance for its rare invertebrate assemblage, with 159 Red Data Book species listed on the site's citation, in addition to a further 21 non-designated habitat specialists. Several of the species listed (e.g. *Arctosa fulvolineata*; a wolf spider species) are saltmarsh specialists associated with coastal habitats on the periphery of the New Forest Ramsar. Nevertheless, the majority of the species listed specialise upon, or are primarily associated with, the New Forest's heathland, broad-leaved woodland (including dead wood and veteran tree micro-habitats), and wetland habitats.

The 159 species listed can largely be categorised by the habitat/s within which they specialise. These key habitat types are provided below, along with examples of the Red Data Book invertebrate species they support:

- **Heathland/heather specialists** (e.g. Heath Grasshopper *Chorthippus vagans*, Shoulder-striped Clover *Heliopsis maritima* (a moth), *Coniocleonus nebulosus* (a weevil), Mottled Bee-fly *Thyridanthrax fenestratus*, and *Halpodrassus umbratilis* (a spider));
- **Established broad-leaved woodland/saproxylic species** (e.g. *Euplectus punctatus* (a short-winged mould beetle), *Procrærus tibialis* (a click beetle), The Triangle *Heterogenea asella* (a moth), and *Pocota personata* (a hoverfly));
- **Bog and mire specialists** (e.g. Large Marsh Grasshopper *Stethophyma grossum*, Sundew Plume *Buckleria paludum* (a moth), *Pachybrachius luridus* (a ground bug), and *Bagous frit* (a sloth weevil)), and;

- **Wetland, pool, and stream specialists** (e.g. Medicinal Leech *Hirudo medicinalis*, *Donacia bicolora* (a leaf beetle), and *Agabus brunneus* (a water beetle)).

2.19 The noteworthy flora within the Ramsar sites includes several species. Many of these are associated with disturbed, seasonally wet ground. They are listed here by microhabitat (note some may be found in more than one):

- **Wet valley mire & bog pool species:** Bog Orchid *Hammarbya paludosa*, Brown Beak-sedge *Rhynchospora fusca*, Slender Cottongrass *Eriophorum gracile* Intermediate Bladderwort *Utricularia intermedia*,
- **Species associated with damp bare ground (e.g. track ruts, seasonal pools, winter-wet hollows):** Marsh Clubmoss *Lycopodiella inundata*, Yellow Centaury *Cicendia filiformis*, Three-lobed Water Crowfoot *Ranunculus tripartitus* Mousetail *Myosurus minimus*, Pennyroyal *Mentha pulegium*, Coral Necklace *Illecebrum verticillatum*, Brown Beak-sedge, Small Fleabane *Pulicaria vulgaris*, Bog Hair-grass *Deschampsia setacea*, Slender Marsh-bedstraw *Galium constrictum (debile)*,
- **Pond margins** Hampshire-purslane *Ludwigia palustris*, Six-stamened Waterwort *Elatine hexandra*, Needle spike-rush *Eleocharis acicularis*, Pillwort *Pilularia globulifera*, Slender Marsh-bedstraw
- **Wet heath species:** Marsh Gentian *Gentiana pneumonanthe*
- **Wet woodland (carr):** Marsh Fern *Thelypteris palustris*
- **New Forest lawns:** Slender Marsh-bedstraw
- **Other:** Annual Beard-grass *Polypogon monspeliensis* (coastal grassland, disturbed ground), Yellow Bartsia *Parentucellia viscosa* (damp acid grassland), Soft-leaved Sedge *Carex montana* (bracken/grass heath), Dwarf spike-rush *Eleocharis parvula* (saltmarsh pans, brackish pool), Corky-fruited water-dropwort *Oenanthe pimpinelloides* (meadows)

2.20 **Touch-me-not-Balsam** *Impatiens noli-tangere* is listed in the noteworthy flora but has not been recorded since 1986 and is considered extinct in the New Forest (Rand & Mundell, 2011).

3. Potential impacts of recreation

3.1 In this section we consider how recreation can impact the relevant interest features described above. Interest features may also be impacted by other factors (such as changes in agri-environment schemes, habitat management techniques, weather conditions, climate change, atmospheric pollution and natural processes) and in some cases these may interact with recreation impacts.

Impact pathways

3.2 We identified the main pathways through which recreational activities may impact on the designated features of the New Forest SAC/SPA/Ramsar, drawing on our experience, observation during the collection of the visitor data, reviews of literature and discussion. We have drawn on general reviews of recreation impacts undertaken at a national level (e.g. Lowen et al. 2008; Liley et al. 2010) and specific work on the New Forest (Tubbs, 2001). Concerns regarding recreation impacts go back many years, for example it was in the early 1970s that concern regarding the lack of restrictions on camping and vehicular access led to extensive recreation management proposals and the provision of dedicated car parks, campsites and restrictions on where people could drive (see New Forest Joint Steering Committee, 1971 for details). Moving forwards 30 years, Tubbs (2001) provides a detailed account of growing pressure for recreation in the Forest, highlighting a growth in nearby urban populations and an increase in the number of visitors. He perceived recreation pressure as a particular concern:

“...I am reaffirmed in my portrait of the Forest as a highly dynamic ecosystem resilient to trauma or catastrophe. Indeed, events and process which can be regarded as catastrophic are to my mind part of the ecosystem. They include drought, hurricanes, summer fires, the recession of the beech population, intensive grazing the past exploitation of the heaths for gravel, turf and marl. All such events, however, are cyclic or periodic. The new pressure for public recreation may be an altogether different matter”.

3.3 We can summarise recreational impacts under the broad headings listed below and in Figure 2. There can also be interactions between the different impacts (e.g. fire may open up new routes).

- **Disturbance;**
- **Fire;**
- **Contamination;**
- **Trampling/wear;**
- **Harvesting;**

New Forest SAC/SPA/Ramsar: Impacts of recreation
and potential mitigation approaches

- **Grazing issues**
- **Visitor expectation.**

3.4 They are reviewed in a national context in various sources and a previous review (Fearnley, Hoskin, Liley, White, & Lake, 2012) considered some of the issues from a New Forest perspective. Here we summarise the activities involved in each pathway and the conservation features likely to be impacted in the New Forest SAC/SPA/Ramsar.

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

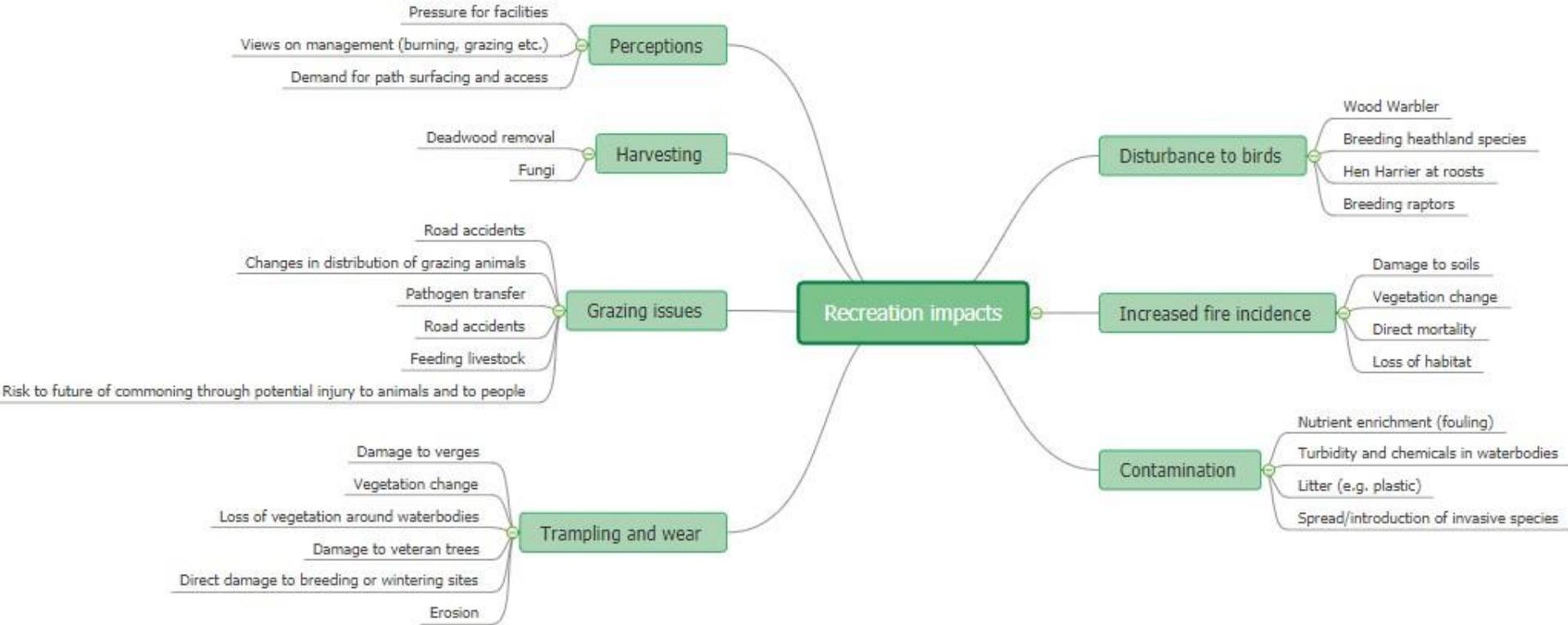


Figure 2: Summary of recreation impacts including examples of features and species affected.

Disturbance

3.5 Disturbance occurs where human activity influences an animal's behaviour or survival. By far the majority of the literature (and there are thousands of studies), focuses on birds (Brawn, Robinson, & Ill, 2001; Hill et al., 1997; for general reviews see Hockin et al., 1992; Lowen et al., 2008; Showler, 2010; Steven, Pickering, & Guy Castley, 2011; Whitfield, Ruddock, & Bullman, 2008). Disturbance can also affect mammals, herptiles (see Edgar, 2002 for review) and invertebrates.

General principles

3.6 The presence of people in the countryside will influence wildlife in many ways. For many species, the people or their pets (e.g. dogs) are a potential threat and as such it is to be expected that the response will be to modify behaviour, for example fleeing. The relative trade-off as to when to change behaviour and respond to the threat will relate to the perceived scale of the threat and the costs involved (e.g. lost foraging time). This perspective can be used to understand the behavioural responses to people and led one author to describe human disturbance as predation-free predators (Beale & Monaghan, 2004).

3.7 With people (and their pets) viewed as potential predators, there is clearly a greater threat posed (and therefore a greater behavioural response) when, for example, there are more people, in larger groups (Beale & Monaghan, 2004, 2005) or when people approach directly (Smith-Castro & Rodewald, 2010) or faster (Bellefleur, Lee, & Ronconi, 2009).

3.8 The presence of people may also draw particular predators, for example a study in America showed the Crow (corvid) populations were centred around campgrounds (Marzluff & Neatherlin, 2006) while Kays *et al.* (2017) used camera traps to show a range of predators actively selected human-made paths. As such the presence of people may also influence the distribution and abundance of predators with a knock-on effect for potential prey species.

Impacts

3.9 Disturbance can therefore have a range of different impacts, potentially affecting distribution, breeding success and health. Impacts can be chronic, for example otherwise suitable nesting habitat being completely avoided (e.g. Liley & Sutherland, 2007) or more short-term in nature, for example birds becoming alert and then resuming the initial activity (e.g. Fernandez-Juricic, Jimenez, & Lucas, 2001). Birds might be temporarily displaced from particular locations and such behavioural responses will have some energetic costs, even if only very short term

in duration. Impacts can also include indirect mortality, for example through increased predation associated with disturbance (e.g. Brambilla, Rubolini, & Guidali, 2004). There are also examples of direct predation by pet dogs, for example dogs were recorded as predators of nests and incubating adult Ringed Plovers *Charadrius hiaticula* on Lindisfarne (Pienkowski, 1984). Some studies have shown evidence of accidental trampling of nests and young, including herptiles (Edgar, 2002) and birds (Durwyn Liley & Sutherland, 2007). Much harder to measure and record are physiological effects, for example related to stress, and these may in turn affect fitness. While studies are limited, there is evidence of physiological effects in terms of increased heart rate (Ellenberg, Mattern, & Seddon, 2013) and stress-hormones (Thiel, Jenni-Eiermann, Palme, & Jenni, 2011).

- 3.10 As such the presence of people may affect birds and other wildlife in a range of ways that are not always easy to measure or record. Many people simply assume disturbance to relate to birds taking flight or fleeing, but in reality these behavioural responses are likely to be only part of a much wider picture.

Types of access

- 3.11 Disturbance has been shown to occur with a range of different types of activities, for example Steven *et al.* (2011), in their review of disturbance impacts to birds listed the following activities and research findings:
- Standing/observing: 15 studies, 14 showing negative effects of disturbance;
 - Touring/walking/hiking: 51 studies, 45 showing negative effects of disturbance;
 - Running: 6 studies, 6 showing negative effects of disturbance
 - Cycling/Mountain bike riding: 3 studies, 3 showing negative effects of disturbance;
 - Canoeing: 3 studies, 3 showing negative effects of disturbance;
 - Dog walking: 11 studies, 11 showing negative effects of disturbance;
 - Horse riding: 0 studies, 0 showing negative effects of disturbance.
- 3.12 More recent studies have highlighted emerging activities such as drones (Mulero-Pázmány *et al.*, 2017).
- 3.13 It is often difficult to separate different types of activities as at many sites multiple activities tend to overlap in space and time. Nonetheless, dogs are often identified as having a disproportionate effect (Banks & Bryant, 2007; Cavalli, Baladrón, Isacch, Biondi, & Bó, 2016; Lafferty, 2001; D. Liley & Fearnley, 2012; Taylor, Green, & Perrins, 2007; Thomas, Kvitek, & Bretz, 2003); dogs are likely to be perceived as a greater threat (i.e. as a predator), will actively chase birds and are able to track wildlife by smell.

Identifying vulnerable species

- 3.14 Virtually all bird species will respond negatively to the presence of people if approached too closely and the conservation objectives (supplementary advice) for the SPA recognise the risk of disturbance for each of the interest features.
- 3.15 In particular, we would highlight:
- Ground-nesting birds as nests will be vulnerable to trampling and chicks to predation by dogs and there is a risk of flushing and predation associated with disturbance;
 - Breeding raptors as large birds tend to flush at bigger distances and raptors can often be sensitive to people around the nest;
 - Breeding birds of all relevant species are likely to avoid areas with high levels of access;
 - Hen Harriers at roost sites, as disturbance may cause displacement and prevent birds from roosting;
 - Very rare species, as there is a greater risk of local extinction for species with small population sizes;
- 3.16 High levels of access (e.g. Figure 3a) will deter breeding birds and render otherwise suitable habitat unavailable. For both Nightjar and Woodlark studies have shown recreation use affects the distribution of birds within sites, such that busy areas are avoided (Liley *et al.* 2006; Mallord *et al.* 2007; Lowe, Rogers & Durrant 2014). For Dartford warblers, breeding productivity is lower in heather-dominated territories where access levels are high (Murison *et al.* 2007), this is because disturbed birds nest later in the season. For Nightjar there is also evidence of breeding success being lower on busier sites and busier parts of sites (Murison 2002). For woodlarks (Figure 3b) at least, there are clear population-level impacts as a result of the presence of people on the heaths (Mallord *et al.* 2007).
- 3.17 Previous analyses of predicted visitor distributions and heathland breeding bird distributions in the New Forest SAC/SPA/Ramsar (Sharp, Lowen, & Liley, 2008) found some evidence (particularly for Woodlark) that areas with high levels of recreation use were avoided.
- 3.18 Wood Warblers are also ground nesting and can nest on banks, even those alongside tracks (Tony Davis *pers. comm.*). Recreation impacts are however thought to be relatively minor although nest monitoring in the New Forest has recorded two nests predated by domestic dogs (Tony Davis *pers comm.*).
- 3.19 Disturbance is known to be an issue for Hobby when nesting and has been associated with breeding failure, even on areas with limited public access (Messenger & Roome, 2007). Breeding Honey Buzzards are widely considered highly susceptible to disturbance, and although some authors contest this they still

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches suggest that Honey Buzzards will avoid nesting in areas subject to continuous disturbance (Roberts, Lewis, & Williams, 1999).

3.20 Little work has been undertaken on disturbance impacts for wintering Hen Harrier. Traditional roost sites are identified as places where access management measures, or exclusions/restrictions, should be implemented in relation to CRoW (Brown and Langston, 2001). A well-known hen harrier roost site in Dorset was abandoned in 1997, with local counters believing that increased access by walkers and other recreational activities was the cause (Lowen et al., 2008).

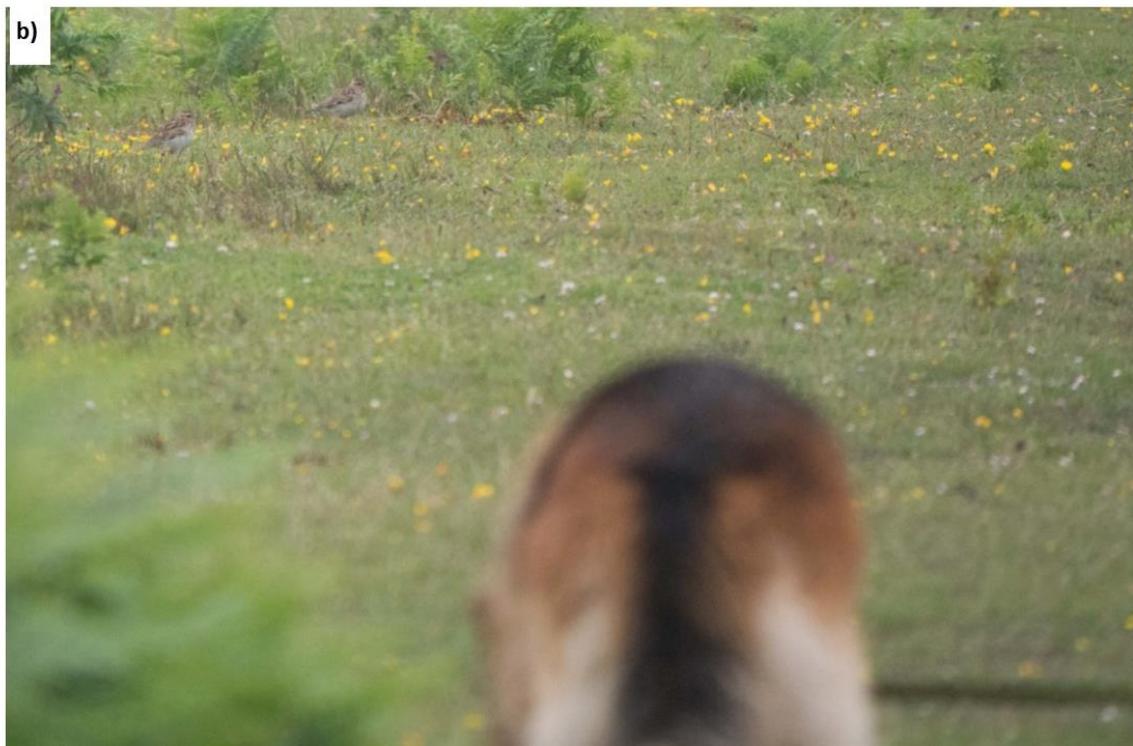


Figure 3: Examples of disturbance. a) Janesmoor on Easter Sunday 2019 showing a high density of people across wide area; b) dog walker and dog unwittingly approaching a Woodlark family with recently fledged chicks (birds are visible top left).

Fire

- 3.21 Wildfire is a much greater issue on heathland than in wet habitats and woodland, as these are less flammable. The incidence of wildfire has been shown to increase with proximity to housing (Tantram, Boobyer, & Kirby, 1999). It tends to be most common in the summer months (Rose & Clarke, 2005) when it is most harmful. Uncontrolled fires can kill many reptiles, and on heathland sites re-colonisation from adjacent unburnt areas can take from 5–25 years (see Underhill-Day, 2005). Similarly, the impact on invertebrates can last many years (see Underhill-Day, 2005). On heathlands, fire can result in the loss of shallow peat soils (see review in Liley et al. 2010). Depending on the vegetation type and burn intensity, wildfires may result in a temporary shift from heathers to grasses (Bullock & Webb, 1995) or to birch woodland soils (see review in Liley et al. 2010). Summer wildfires also remove breeding and foraging habitat for a range of species. Fires can also open up new access routes by reducing the height of vegetation.
- 3.22 Wildfire may decrease nutrient build up through the removal of the organic litter layer, but this is done more constructively during controlled burns carried out in winter for habitat management purposes.
- 3.23 Some fires are a consequence of arson, others are results of barbeques and campfires (which are frequent in popular areas in the New Forest SAC/SPA/Ramsar). Disposable barbeques are only permitted at designated sites where stands and water are provided. Raised non-disposable barbeques are allowed in gravelled car parks only. However, currently these rules are not always adhered to (see Figure 4a-d).

Contamination

- 3.24 Dog fouling is a widely recognised issue in low-nutrient semi-natural systems. The resulting increase in nitrogen and phosphorus changes vegetation communities, encouraging bulky competitive species at the expense of less vigorous species adapted to low-nutrients situations. Due to their low nutrient status, heathlands and acid grassland are particularly vulnerable. A change from typical heathland species to rank species-poor grassland communities is common along and on the margins of paths and tracks and around car parks.
- 3.25 Urination is also an issue, particularly where dogs scent-mark the base of trees. This can result in the loss of lower plant communities in the affected area (see Figure 4h). The ammonium in urine is toxic in quantity and may also harm the tree bark and potentially the cambium layer. The build-up of nutrients may also damage mycorrhizal associations.

- 3.26 Contamination may also result from persistent veterinary compounds that are transferred into the aquatic environment by domestic animals (mostly dogs and ridden horses). These may include worming treatments and external parasite treatments. The impact of such compounds on invertebrates in New Forest SAC/SPA/Ramsar water bodies is unknown.
- 3.27 A further consideration is that of sunscreen and other personal care products. Personal care products containing oxybenzone and octinoxate are being banned from some areas of the world where they are thought to be contributing to the disruption of marine ecosystems. In freshwater systems, carbon-based and nano-particulate UV filters have been shown to negatively impact invertebrates (e.g. (Schmitt, Oetken, Dittberner, Wagner, & Oehlmann, 2008) and may impact algae and fish through DNA damage, bio-accumulation of harmful chemicals, and lower quality and quantity of food sources at the base of the food web. Many of the waterbodies in the New Forest SAC/SPA/Ramsar are entered by people in the summer, particularly playing children likely to be wearing sunscreen. Any impacts in the aquatic systems of the New Forest SAC/SPA/Ramsar are unknown.
- 3.28 Waterbodies may also be contaminated by greywater from the many campervans that use the New Forest SAC/SPA/Ramsar. Run-off from roads may also add contaminants to water bodies. A further issue relating to the contamination of permanent water bodies is the fish that many are stocked with, both officially and unofficially, which results in detrimental turbidity, eutrophication and herbivory.
- 3.29 Littering is also a problem related to recreation pressure. In most cases this is unsightly rather than damaging to the interest features of the New Forest SAC/SPA/Ramsar (although it can impact small mammals, lizards and wading birds through being trapped in bottles or cans, becoming tangled in fishing lines or ingesting lead weights). However, some litter can be a serious problem if ingested by livestock (e.g. plastic bags, inappropriate or contaminated food etc.). Fly-tipping of garden waste can also be a hazard to livestock, as shrub prunings and mown grass may be toxic, but this is not directly associated with recreational pressure.
- 3.30 The spread of exotic species can be associated with recreation pressure. For example, there is an issue with people introducing non-native carnivorous plants such as Pitcher Plant *Sarracenia purpurea* into valley mires and water lilies into ponds. Additional footfall and dogs entering water bodies may increase the spread of species such as New Zealand Pigmyweed *Crassula helmsii*. A sensitive issue is the ornamental species that may be introduced at 'in memoria' sites including those where funeral ashes/caskets are sited.

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches



Figure 4: Examples of fire and contamination impacts from the New Forest SAC/SPA/Ramsar. a) Fireman putting out campfire, b) fire risk sign, c) barbeque at Longcross; d) barbeques at Linford bottom; e) discarded rubbish at Fritham car park; f) fly-tipping example; g) garden rubbish dumped at Janesmoor; h) tree with signs of dog urine impact, Burley Cricket; i) dogs fouling near Appleslade.

Trampling

- 3.31 Trampling can directly damage plants, lead to loss of vegetation and/or a change in plant species composition and cause compaction or poaching of the substrate, with implications for plant species composition. The level of trampling that will cause damage depends on a variety of factors including soil type and moisture content, aspect and slope, season, microclimate, behaviour of walkers etc (e.g. walking up or down the slope) and the vegetation type (see Liley *et al.* 2010 for a review). Due to this range of factors, it is difficult to predict thresholds at which significant vegetation change will occur. Pascoe (2013) found a significant correlation between the distribution of Field Gentian *Gentianella campestris* and trampling on the grasslands of the New Forest, but suggested that it, together with Autumn Lady's-tresses *Spiranthes spiralis*, may not be under threat from trampling provided the trampling impact does not extend further into previously lightly or untrampled areas.
- 3.32 In supressing plant growth and creating bare ground (Figure 5e), trampling can also result in conditions suitable for scarce heathland specialities for which the New Forest SAC/SPA/Ramsar is a stronghold, such as Yellow Centaury *Cicendia filiformis*, Marsh Clubmoss *Lycopodiella inundata* and Coral Necklace *Illecebrum verticillatum* that would otherwise be outcompeted by more vigorous species. Bare ground is also required for a large number of invertebrates (particularly bees and wasps) and species such as Sand Lizard *Lacerta agilis*. There is a balance between sufficient trampling to create and maintain bare ground, and excessive wear (e.g. from horses or mountain bikes) that continually disturbs the substrate and damages or destroys any colonising species.
- 3.33 Heather-dominated communities are particularly vulnerable to trampling, which can shift communities towards grassland. Within the New Forest SAC/SPA/Ramsar, wet heath and valley mire are most vulnerable to persistent trampling, with bog mosses (*Sphagnum* spp.) among the most susceptible species (one study in Scotland found that 80 passes was sufficient to destroy the *Sphagnum* plants – see Liley *et al.* 2010 for a review). Tufted species such as Deer-grass and Black Bog Rush are more resilient, while a limited amount of trampling will create bare ground niches for species such as Sundews *Drosera* spp. and Pale Butterwort *Pinguicula lusitanica*. However, these habitats are in general less likely to be accessed due to the wet conditions underfoot than dry heathland and grassland or open woodland.
- 3.34 In general, woodland ground floras are susceptible to trampling as many woodland species have adapted to shady conditions with large leaves and thin cell walls. The New Forest SAC/SPA/Ramsar woodlands do not support many vascular plant species of national conservation concern (Wright & Westerhoff, 2001), but do

have a rich flora of characteristic species. Excessive trampling by people, for example at honeypots and along tracks (e.g. Figure 5d), can result in the localised loss of ground flora and this has been well documented within the New Forest (Cox, 1996b, 1996a, cited in ; Tubbs, 2001). The New Forest SAC/SPA/Ramsar is of particular significance for its veteran trees, which can be negatively affected by trampling. Trampling resulting in compaction around the roots will have a detrimental effect on roots and associated soil fungi and can lead to tree death in veteran trees, which may be preferentially approached. Climbing of trees may also lead to damage.

- 3.35 Trampling can also be an issue in and around waterbodies, including permanent, ephemeral and seasonal pools and running waters. Water bodies such as Hatchet Pond, Janesmoor Pond, Cadnam's Pool, Longcross Pond, Setley Pond, Ocknell Pond, the Lymington River at Puttles Bridge, Ivy Wood, and Brockenhurst Splash Bridge tend to be targeted as visitor destinations. Although a degree of trampling in the margins of pools can create ideal conditions for species such as Pillwort *Pilularia globulifera*, continued trampling (for example from dogs, horses and people on the bankside or entering the water) can stir up the sediment, reducing water quality and damaging aquatic plants. Excessive trampling will result in the loss of fringing vegetation and the creation of worn, compacted edges (e.g. Figure 5c) – this has resulted in the complete loss of the transition from aquatic to terrestrial vegetation at, for example, Cadnam's Pool and reaches of the running water sites listed above (C. Chatters pers. comm.).
- 3.36 Soil compaction and erosion issues are not only related to footfall. Bicycles can damage soils and vegetation more than foot passage (Martin, Butler, & Klier, 2018) and the impact of a horse plus rider is even greater in terms of ground pressure (see Liddle, 1997 for review). Vehicles parking on road verges (e.g. Figure 5a) are a particular issue, leading to localised damage alongside some roads (e.g. Figure 5b). Repeated wear will result in bare edges and a loss of vegetation, likely to be of particular concern for those verges with specialist flora such as small fleabane.

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches



Figure 5: Examples of trampling damage. a) Verge parking at Furzeley; b) road verges at Cadnam; c) Ocknell Pond with lack of fringing vegetation around pond; d) heavily poached path at Wilverley; e) eroded path across heath, Hinchelsea Moor; f) Rockford Sandpit (with NT sign inset)

Grazing issues

- 3.37 Livestock grazing is an integral part of the traditional management of the New Forest and plays a key role in shaping habitats. There are several pathways through which recreational pressure can impact on grazing livestock: worrying, road accidents (although many may not be due to recreation), transfer of diseases, feeding and petting livestock, damage to infrastructure and visitor perceptions and expectations of the New Forest SAC/SPA/Ramsar as an area for recreation. Increased visitor pressure in combination with increases in the numbers of animals turned out on the Forest, is likely to exacerbate all of these.
- 3.38 Livestock worrying is generally considered to be a particular issue with sheep, but young calves and foals are also vulnerable to dog attacks and fatal attacks are reported⁷ each year. Dogs will approach and chase all livestock (e.g. Figure 6d) and this can be dangerous, for example when animals run onto the road or towards people. Where young animals are killed, injured or threatened, adult livestock may be more likely to react badly to the presence of dogs, endangering both dogs and people. It also has implications for the sustainability of livestock grazing, as, if aggressive individuals cannot be identified, entire herds may have to be removed from the Forest⁸. Attacks may be carried out by dogs escaping from properties in or directly adjacent to the Forest in addition to those being exercised in the Forest.
- 3.39 Dogs are also an issue for the welfare of livestock through the transfer of pathogens such as Neospora from dogs to cattle through dog faeces. Neospora causes abortion in infected cattle.
- 3.40 While dogs are a particular issue, other activities can also alarm livestock. In addition to increasing the potential for accidents, this can interfere with livestock management.
- 3.41 The New Forest SAC/SPA/Ramsar is bisected by numerous roads, bringing cars and livestock into proximity (e.g. Figure 6f). Road traffic accidents involving livestock are also a regular occurrence in the New Forest – for example the Verderers reported 63 animals killed or put down due to the severity of their injuries in 2018, with a further 26 animals injured. Parking on verges (e.g. Figure 6a) rather than in car parks can limit drivers' view of livestock, adding to the risk. Parking in gateways can prevent access by livestock keepers. Depending on the management of parking, this could increase with a rise in visitor numbers.

⁷ <https://www.advertiserandtimes.co.uk/new-forest-dog-attack>

⁸ <https://www.advertiserandtimes.co.uk/new-forest-cows-slaughtered>

- 3.42 Feeding and petting ponies is an issue in the New Forest SAC/SPA/Ramsar (e.g. Figure 6b, c, e). Visitors enjoying the interaction with free-roaming ponies and donkeys are often tempted to feed them. This can attract them to locations where they are more vulnerable to traffic accidents or dog attacks, such as roadsides (see Figure 6h) and car parks and influence the distribution of livestock within the New Forest SAC/SPA/Ramsar. It can also result in incidents of aggression, as it increases the number of interactions between equines and people, and ponies learn to expect food and may respond aggressively if it is not forthcoming. It may also result in the livestock being fed inappropriate foodstuffs.
- 3.43 Recreational pressure can also result in the displacement of livestock with, for example, reports of incidents such as livestock being driven away from a pond to allow model power boating.
- 3.44 There is a link between fire risk and grazing, as grazing can reduce fuel loads on heathlands and therefore the risk of major wildfires (e.g. Cavan & McMorrow, 2009; Legg & Davies, 2009). Any future marked reductions in grazing (e.g. as a result of the challenges of grazing alongside high levels of access) could have knock on effects for fire risk across the Forest.
- 3.45 The New Forest SAC/SPA/Ramsar is a pastoral system – the nature conservation features for which it is designated are dependent on the maintenance of appropriate grazing. The various issues arising from interactions between recreation pressure and livestock highlighted above potentially jeopardise the future of commoning, the long-standing land-use system that has allowed the continuation of extensive grazing within the New Forest. These impacts should be considered in the context of a suite of issues currently impacting on commoning in the New Forest (see Chatters & Kernohan 2013) .

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

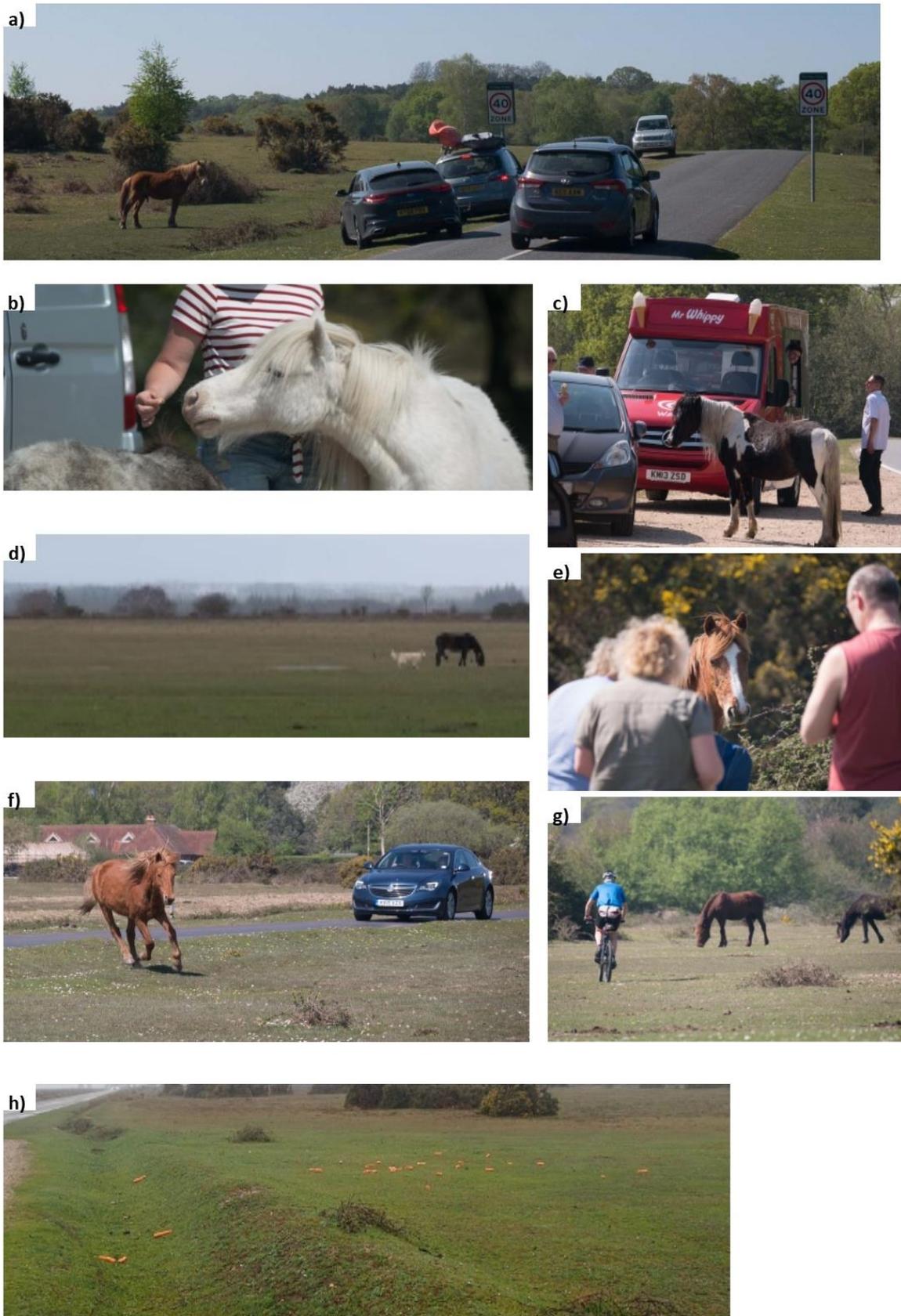


Figure 6: Examples of grazing issues. a) verge parking near Furzeley to view ponies; b) pony being fed; c) pony and ice cream van; d) dog approaching pony at Wilverley; e) pony approaching family barbecue at Stoney Cross; f) car and pony, near Janesmoor; g) mountain biker approaching ponies near Stoney Cross; h) abandoned carrots at Stoney Cross.

Harvesting

- 3.46 Removal of deadwood is a major threat to saproxylic (deadwood) invertebrates (Kirby, 2001; Alexander et al., 2005g; Alexander et al., 2005h; Alexander et al., 2005i; Alexander et al., 2005j). This micro-habitat is often removed for health and safety reasons and also by the public for campfires etc. Campfires are not permitted at campsites within the New Forest SAC/SPA/Ramsar, wood collection is not permitted and there is a safe barbeque code. However, barbeques are frequent in the summer away from designated sites and campfires do occur (e.g. Figure 4, a, c and d), and these may involve wood collection and possibly bark stripping. Deadwood is also collected by children for den-making (Figure 7a), in which it is generally propped vertically against a branch or similar. Repeated and protracted den-making in popular areas can result in the removal of significant amounts of deadwood from the woodland floor, greatly reducing its value for invertebrates.
- 3.47 There has been concern about the impact of harvesting fungi in the New Forest SAC/SPA/Ramsar (and at other much-visited sites) in the light of apparent increases in commercial harvesting. Long-term research from Switzerland found that the trampling associated with harvesting reduced the abundance of fruiting bodies affecting species diversity, but that cutting and picking themselves did not significantly reduce the overall abundance or diversity of fungi (Egli *et al.* 2006 and references therein). Given a lack of knowledge about the abundance of spores required to maintain populations, a 'closed season' was recommended by the authors. A reduction in fruiting bodies could also impact on invertebrates associated with fungi.
- 3.48 Commercial picking is an offence under the Theft Act 1968 without the permission of the landowner and since 2016 the Forestry Commission (now Forestry England) have made this clearer to the public with the use of "No Picking" signs (Figure 7b).
- 3.49 There are some particular issues associated with fishing, these relate to stocking (see under contamination) and also trampling damage around the edge of water bodies (see trampling). Also, possibly of localised concern is impacts associated with children with fishing nets in streams and water bodies. This may be an issue where rare species such as Southern Damselfly are present.



Figure 7: Examples of harvesting impacts. a) den near Vereley; b) sign about mushroom picking

Perceptions

- 3.50 Visitor perception of the New Forest SAC/SPA/Ramsar is vital as it influences visitors' behaviour and shapes their expectations. For example, well-maintained infrastructure is more likely to result in careful and considerate use of and respect for car parks, bins etc. and also signs and their messages. In less well-maintained situations the reverse is more likely to be the case.
- 3.51 Where visitor expectations and understanding are not aligned with the rural nature of the Forest, conflict can arise. This is a component of some above issues, such as petting and feeding or harassment of livestock. It may also be an issue if visitors are not comfortable with some elements of traditional land-use in the Forest, particularly livestock grazing and the associated practice of controlled burning. Visitors who consider the Forest first and foremost as a recreational destination may be less willing to take into account requirements dictated by land use or the wildlife of the Forest (such as keeping dogs under control). Increasing visitor use can lead to the expectation that certain areas should be primarily available for recreational pursuits or to a lack of willingness to see changes required for conservation or pastoral purposes, particularly changes that might result in a perceived loss of amenity. This issue is identified by Grant & Edwards (2008), who identify the risk that management strategies in the New Forest will be greatly constrained unless conflicts about values and uses are resolved.
- 3.52 Perceived visitor requirements can also influence management decisions, for example, surfacing heathland paths (to the detriment of specialist species that exploit the bare ground habitat) or creating additional routes, board walks etc for recreational purposes. The use of verges for parking leads to vegetation loss, soil

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches
compaction and, as such sites become more widely used, the creation of unofficial car parks.

Overview of different impacts

3.53 In Table 3 we provide an overview of the different impact pathways and the interest features that are potentially vulnerable to that impact. Clearly the impacts identified vary in severity, likelihood of occurrence (risk) and some affect particular interest features while others are more general. While there are some marked differences between the issues raised (den building is perhaps of less concern compared to access fundamentally undermining the long-term future of the traditional grazing), we have refrained from ranking or scoring them. This is because some issues are likely to vary in their severity or risk in both time and space, for example wildfires are only likely to start in particular weather conditions. Some impacts will depend on the status of the species concerned. With Wood Warbler being on the verge of extinction in the New Forest SAC/SPA/Ramsar, any impact of disturbance on the species will be of concern. Furthermore, some of the issues might, on their own, be considered of relatively little consequence when broken down and discussed on an individual basis, as a single occurrence in one part of the New Forest SAC/SPA/Ramsar. Yet it is the overall impact of all the issues in synergy that needs to be considered, in the context of how access is spread across the New Forest SAC/SPA/Ramsar, all year round.

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

Table 3: Potential vulnerability of key habitats and species to recreational pressure in the New Forest SAC/SPA/Ramsar. Changing perception may impact on any habitat or species.

Feature	Disturbance	Fire	Trampling	Contamination	Changing perceptions	Harvesting	Notes
3110 Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>)			✓	✓	✓		Loss of transitional vegetation, contamination through increased turbidity and veterinary compounds
3130 Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i>			✓	✓	✓		As above
H4010 Northern Atlantic wet heaths		✓	✓	✓	✓		Trampling and dog fouling on path edges and around car parks
H4030 European dry heaths		✓	✓	✓	✓		As above
H6410 <i>Molinia</i> meadows		✓	✓	✓	✓		As above
H7150 Depressions on peat of the <i>Rhynchosporion</i>				✓	✓		Likelihood of most impacts relatively low due to inaccessibility
91D0 Bog woodland					✓		Likelihood of most impacts relatively low due to inaccessibility
H91E0 Alluvial forests			✓		✓		
H9120 Atlantic acidophilous beech forests			✓	✓	✓	✓	Disturbance of deadwood, vegetation loss, damage to veteran trees
H9130 <i>Asperulo-Fagetum</i> beech forests			✓	✓	✓	✓	As above
H9190 Old acidophilous oak woods with <i>Quercus robur</i> on sandy plains			✓	✓	✓	✓	As above
H7230 Alkaline fens				✓	✓		Many impacts limited due relative inaccessibility

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

Feature	Disturbance	Fire	Trampling	Contamination	Changing perceptions	Harvesting	Notes
7140 Transition mires and quaking bogs				✓	✓		Many impacts limited due relative inaccessibility
Dartford warbler	✓	✓			✓		Evidence that breeding can be delayed where high levels of access
Nightjar	✓	✓			✓		Evidence for disturbance impacts on territory distribution and breeding success
Woodlark	✓	✓			✓		Evidence of lower densities where access levels high
Hen harrier	✓				✓		Potentially vulnerable at roost sites.
Honey buzzard	✓				✓		Potentially vulnerable around nest sites
Wood Warbler	(✓)				✓		Ground-nesting and disturbance may add to pressures on rapidly disappearing species
Hobby	✓				✓		Potentially vulnerable around nest sites
Southern Damselfly	✓		✓	✓	✓		Potentially vulnerable - Localised and likely to remain in known locations
Stag Beetle					✓		Loss/disturbance of deadwood habitat
Inverts: Heather/heathland specialists		✓			✓		
Inverts: Broad-leaved woodland/saproxyllic species					✓	✓	Loss/disturbance of deadwood habitat
Inverts: Bog and mire specialists					✓		
Inverts: Wetland, pool & stream specialists				✓	✓		

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

Feature	Disturbance	Fire	Trampling	Contamination	Changing perceptions	Harvesting	Notes
Plants: Wet valley mire & bog pool species				✓	✓		Vulnerable to trampling but habitat inaccessible
Plants: Damp, bare ground species			✓	✓	✓		Trampling likely to be beneficial up to a threshold beyond which it is damaging
Plants: Pond margins species			✓	✓	✓		
Plants: Wet heath species			✓	✓	✓		Localised trampling may be an issue
Plants: Wet woodland species			✓	✓	✓		Localised trampling may be an issue
Plants: New Forest lawns			✓	✓	✓		Localised trampling may be an issue
Plants: Other grassland/pool habitats			✓	✓	✓		Localised trampling may be an issue

Condition and general evidence for impacts

- 3.55 Natural England's site improvement plan from 2014 identifies a range of pressures and threats to the condition of the New Forest SAC and SPA, and in particular highlights:
- A significant long-term reduction in grazing pressure through loss of commoning. This would lead to a dramatic change in the flora and fauna of the New Forest and the impoverishment of the special features for which it was designated.
 - Impacts of recreation including disturbance to qualifying Natura 2000 species and compaction, abrasion and other modifications to vegetation, soils and watercourses.
 - Historic drainage of wetlands which leads to a loss of extent of wetland habitats such as wet heath, mire, riverine and bog woodland.
 - Sylviculture plantations with recognisable remnants of SAC Annex 1 habitats such as heathland, mire, lawn, riverine and bog woodland.
 - Loss of traditional management practices which can lead to a loss of extent and diversity of open habitats.
- 3.56 The SSSI condition assessment⁹ records that 54.4% of the SSSI is in favourable condition, 41.9% is in unfavourable recovering condition, 2.1% is unfavourable no change and 1.4% unfavourable declining.
- 3.57 It is important to note that the SSSI condition assessments are not necessarily designed to pick up and record recreation impacts and are based on a single visit by a Natural England officer. Issues such as bird disturbance are unlikely to be picked up or systematically recorded. Many of the units are very large, and if recreation issues are only in a part of the unit, they may not necessarily be picked up. Nonetheless, recreation impacts (or possible recreation impacts) are identified in the condition assessment for 18 different SSSI units, with comments covering topics such as trampling, disturbance, vehicular damage, dead wood removal and littering. Some of the units with issues are in favourable condition. We have included selected extracts from the condition assessments in Appendix 1. Some units clearly have very marked recreation issues, for example at Hollands Wood Campsite:

⁹ Accessed from the [Natural England website](#) on 22/10/19

New Forest SAC/SPA/Ramsar: Impacts of
recreation and potential mitigation approaches

"The whole area is subject to very high visitor pressure and high levels of trampling, removal of dead wood and disturbance of wildlife. There are numerous indications of damaging impacts on the special interest features."

At Balmer Lawn:

"In places there are indicators that recreational use is having a negative effect on diversity especially close to the campsite from trampling and BBQ's"

At Hatchet Pond:

"high levels of recreational disturbance have left much of the bank closest to the car park bare and compacted"

4. Mitigation

- 4.1 Using estimates of possible housing levels over the period 2018-2036 and the visitor survey results (see visitor survey summary report) we estimate that there will be an increase in the level of access of around 11%, solely from new housing within a 25km radius. There will be further increases above this as a result of tourism (staying visitors from a wide geographic spread) and day visits from people living beyond 25km. Previous sections highlight the current condition and status of the interest features and potential risks from recreation. While there are clearly a range of factors influencing the status and distribution of relevant interest features, many species are not doing well in the New Forest. More visitors will increase the pressure in general, exacerbate the current issues and there is the potential for further impacts. In this section of the report we consider the options for mitigation.
- 4.2 Each planning authority should have a well-informed and articulated mitigation scheme, commensurate with the distribution of proposed development in relation to the New Forest SAC/SPA/Ramsar. Ideally these schemes would aim to achieve similar outcomes, through a single joined-up approach. In other parts of the UK¹⁰, strategic approaches to mitigation have been established where multiple local authorities fund a series of consistent, agreed and implementable measures carefully designed to resolve the in-combination impacts associated with local development. In this section we consider the kinds of measures which might be applicable to the New Forest SAC/SPA/Ramsar and the benefits of a proportionate and co-ordinated strategic, approach.

Background

Legislative context

- 4.3 Relevant European and domestic legislation is cited in the introduction and these provide strict protection to our most important nature conservation sites, such as the New Forest. The application of the European legislation needs to be made with regard for the way in which the protective requirements should be secured by public bodies. The legislation requires

¹⁰ For example the Dorset Heaths, the Thames Basin Heaths, South-east Devon, Cannock Chase and the Solent

public bodies to be proactive, rather than reactive. The overarching objective is to maintain sites and their interest features in an ecologically robust and viable state, able to sustain and thrive into the long term, with adequate resilience against natural influences. This requires public bodies to put measures in place to prevent deterioration of European sites, not to wait until there is harm occurring that needs to be rectified. Where European sites are not achieving their potential, the focus of attention by public bodies should be on restoration.

- 4.4 Public bodies are referred to as ‘competent authorities’ within the legislation. The duties set out within the Habitats Regulations in relation to the consideration of plans and projects are applicable in situations where the competent authority is undertaking or implementing a plan or project, or authorising others to do so. The assessment process is called a Habitats Regulations Assessment (‘HRA’) and it is the HRAs of local plans relating to the areas within and adjacent to the New Forest that have identified the issue of increased recreation pressure on European sites as a result of housing development and the associated increased population. The European legislation is founded on the ‘precautionary principle’, i.e. it is necessary to demonstrate that impacts will not occur, rather than have proof that they will.

Wider context

- 4.5 It is relevant to note that there is an existing strategic approach to recreation issues from housing around the Solent, which includes the shoreline within the New Forest National Park. In addition, looking west, there is a strategic mitigation approach for the Dorset Heaths. As such there are established approaches to mitigation and there is likely to be some overlap, as people may well visit both the heath/woodland areas and the coast.
- 4.6 Within the New Forest SAC/SPA/Ramsar site access to many areas is a legal right, with open access to many areas. There are in excess of 30,000ha of unenclosed land where people can walk freely (NFNPA, 2010) and this includes the heaths, woodlands and commons managed by the Forestry England, National Trust, Hampshire County Council and others.
- 4.7 The second statutory purpose of the English National Parks (including the New Forest) is to promote opportunities for the understanding and enjoyment of the special qualities of the area by the public. The Government's recent Landscapes Review (Glover, 2019) has proposed a

further strengthening of this so that people have better opportunities to experience our nationally protected landscapes. It has however long been recognised that there can be potential conflicts between balancing recreation and nature conservation in National Parks. The Sandford Principle¹¹ recognises that if there is a conflict between protecting the environment and people enjoying the environment, that can't be resolved by management of a National Park, then protecting the environment takes precedent.

Existing recreation management measures and HRA findings

4.8 Recreation has been managed in the New Forest for many years (see NFNPA, 2010 for background). It was in 1972, following the conservation plan (New Forest Joint Steering Committee, 1971) that the current network of car parks was created and cars were stopped from driving across the lawns and open land. In the early 1990s the 40mph speed limit on unfenced roads was introduced within the Perambulation of the Forest. The Recreation Management Strategy (RMS) set out a strategic direction for the management of outdoor recreation in the New Forest National Park from 2010 – 2030 (NFNPA, 2010). More recently it has been recognised that the strategy needs updating. Forestry England, Natural England, Hampshire County Council, New Forest District Council, Test Valley Borough Council, the Verderers and the New Forest National Park Authority have been working together on that update, which included a Future Forest consultation in 2017 and further public consultation in 2018.

4.9 The update¹² has identified 22 strategic actions which fall under seven broader objectives:

- Convey the things that make the New Forest National Park special to both visitors and local people in more consistent and effective ways, so that they enjoy it, come to value it, want to care for it and do not inadvertently damage it;
- Address significant and/or widespread negative impacts caused by recreation in the most appropriate, proportionate and effective ways;
- Reduce the barriers that limit participation in beneficial outdoor recreation among those who need it most;

¹¹ Named after Lord Sandford, who chaired the 1974 National Parks Policy Review Committee.

¹² May 2019 update, <https://www.newforestnpa.gov.uk/app/uploads/2019/07/Recreation-Management-Strategy-Strategic-Actions.pdf>

- Protect and enhance the New Forest’s working and natural landscape, and improve the recreational experience, by influencing where recreation takes place;
- Increase the level of funding available for recreation management so that it is sufficient to address both existing and upcoming needs;
- Collate data and evidence to help inform the ongoing management of recreation;
- Regularly review progress against agreed recreation management actions and adapt forward plans to protect the special qualities of the National Park and enable people to enjoy and benefit from them.

4.10 The Recreation Management Strategy therefore plays a wider role than that required to mitigate the impacts of recreation on the SPA/SAC arising from new development (the focus of this study). The Recreation Management Strategy is much broader in its aims and relates to people visiting from anywhere, including people on holiday.

4.11 HRA work at plan level has identified recreation issues and the New Forest SAC/SPA/Ramsar site for a number of local authorities surrounding the New Forest SAC/SPA/Ramsar. In order to rule out adverse effects on integrity for existing plan documents, a range of mitigation measures and approaches have been established in policy. For example, the New Forest District Council, the New Forest National Park Authority and Test Valley Borough Council each have an established approach for mitigation delivery that includes measures such as rangers, provision of alternative greenspace and improvements to public rights of way.

Benefits of a strategic approach

4.12 The measures developed for the Recreation Management Strategy are likely to help mitigate impacts on the designated sites, but there remains a key role for a mitigation strategy focused on the impacts of planned new development. Where impacts relate to the cumulative, in-combination effects of development over a wide area, effective mitigation is very difficult to deliver on a dwelling by dwelling basis. A broad ‘package’ of mitigation measures is likely to prove the most effective, potentially involved visitor engagement, access management within the New Forest SAC/SPA/Ramsar site and provision of new green infrastructure. These can only be funded and established through some kind of partnership approach. A strategic approach is built on the principle that by putting together a suite of

interrelated measures, that work collectively to target key mitigation areas such as visitor education, dedicated staff, visitor infrastructure improvements or providing alternative locations for some aspects of recreation, a robust multi-layered strategy can give certainty in effectiveness. By working together, local authorities can ensure consistency and allow measures to spill across their respective boundaries.

- 4.13 There are benefits for developers as mitigation measures that would otherwise be undeliverable can be secured and established up front, by the local authority. The costs are transparent, known in advance and the developer avoids the risk of development being refused due to impacts to the New Forest SAC/SPA/Ramsar from recreation. With a consistent approach there is less chance of development in one location being subject to different costs and mitigation requirements to another location just over a local authority boundary.
- 4.14 There is also the potential for additional benefits. Proportionate and co-ordinated strategic mitigation allows ambitious programmes of green infrastructure to be carefully planned, bringing benefits to local communities. There can also be opportunities to provide biodiversity net gain through the creation of new green spaces (even if managed primarily for access).

Our approach to identifying possible approaches to mitigation

- 4.15 Working closely with the steering group and drawing on the results of the visitor survey work undertaken in parallel with this report, we have identified a number of potential mitigation options. These fit with the strategic actions identified through the work to update the New Forest National Park Recreation Management Strategy 2010-2030 and are also intended to guide relevant authorities' approach to mitigating future housing growth in compliance with Habitats Regulations.
- 4.16 These mitigation options are set out below under different headings that include alternative greenspace, access management within the designated sites and education and awareness raising. Under each heading we list the options as a series of bullet points and then summarise key points that arose from a workshop, held in July 2019, with a range of stakeholders including Verderers, commoners, local authority staff, representatives from the National Park, Natural England and conservation NGOs. As relevant, we then

discuss the options in more depth, drawing on the visitor survey results to consider how they might inform some of the measures.

4.17 All options are then summarised together at the end of the report.

Alternative recreational greenspace sites and routes outside the New Forest SAC/SPA/Ramsar

4.18 These approaches are off-site, away from the New Forest SAC/SPA/Ramsar site and involve measures to accommodate recreation in more robust areas, including (in no particular order):

- **Improvements to existing greenspaces** to attract and accommodate increased use (more people or/and increased dwell time)
- **Provision of new greenspaces within or adjoining residential development sites** to provide appropriate alternative recreational facilities 'on the doorstep' of residents of those new housing developments.
- **New 'destination' greenspaces** (e.g. country parks) designed to attract people from surrounding towns and villages
- **Designated locations** for off-lead dog walking/training and 'bike parks' (could be a commercial venture on private land)
- **Improved rights of way** (public footpaths and bridleways) to increase usage (through higher levels of maintenance, enhanced signage and/or interpretation)

4.19 At the workshop held in July 2019, key points relating to alternative greenspace sites included:

- Overall support for all options, ranging from large country parks to the minor improvements to local footpaths, as part of a 'toolkit' for mitigation;
- Any greenspaces need to have attractive features, targeted at the relevant site user groups, such as dog walkers, and be of a high quality.
- Important to provide a choice of greenspace for the needs of 'locals' vs. 'tourists' which seek different experiences. Locals need closer, convenient sites for more regular use.
- The provision of a new large country park was the one identified potential measure currently missing from the mitigation packages already being implemented by local planning authorities. The pooling of developer contributions from development across the identified catchment area would assist in funding such provision.
- There are some clear examples of large country parks which work well e.g. Upton, Moors Valley (but may already be capacity issues at these). Cost and space are the main issue for these parks but capacity could be increased by working across local authorities/partners.

- Alternatives need to be easier and possibly cheaper (depending on the experience being offered). The use of alternative greenspace provision could be incentivised by charging for car parking within the designated habitats, if verge parking could be contained.
- Alternatives provided as part of developments would be good (such as local community woodlands) and could be built into local plans. The draft New Forest District Local Plan will deliver significant new greenspace areas and consideration should be given to its design to attract users.
- A circle of alternative greenspaces around the New Forest SAC/SPA/Ramsar site could help intercept visitors (main current gap in this would be to the north). There could be greater promotion of these alternatives around the edge of the New Forest to intercept visitors.
- Greenspace provision and countryside access outside the New Forest SAC/SPA/Ramsar site needs to respect other European sites, such as the coast. On the coastal designated sites, some of the vulnerable interest is in the winter, so summer promotion potentially poses no immediate conflict;
- Creation and promotion of greenspaces should be in parallel to access management measures and education and communication, forming a package of measures.

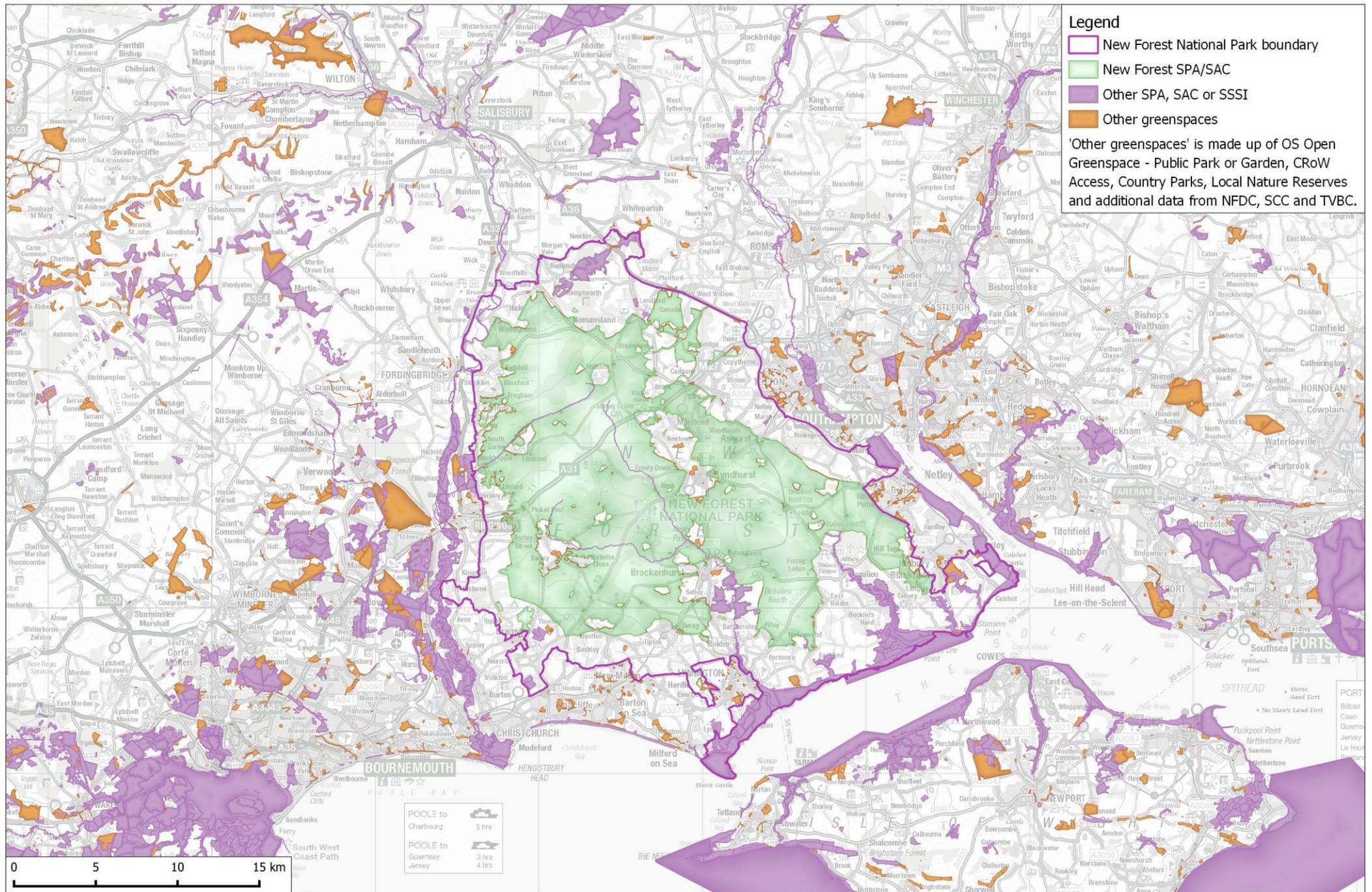
Insights from the survey results

- 4.20 The interview results, for example from the telephone survey, indicated that there was a relatively similar likelihood of use for a range of different green infrastructure approaches and as such, all potentially have merit. In general, both the telephone survey and on-site survey showed less support for a new Country Park compared to other options and the telephone survey results found a greater level of interest in new small parks. In the telephone survey, interviewees living further away from the New Forest (e.g. 10-20km) tended to be more positive about Country Parks than those who lived closer. There was also a slight difference between walkers and dog walkers in that higher proportions of dog walkers preferred a country park to improved footpaths and links.
- 4.21 The on-site survey showed a clear and striking pattern of high levels of use by local people, particularly dog walkers, at the car parks around the periphery of the New Forest SAC/SPA/Ramsar site. Many of these people are clearly choosing their nearest greenspace (see para 4.41 for more discussion on the choice of nearest car parks). Provision of alternative greenspace for such visitors, combined with changes to access management in the New

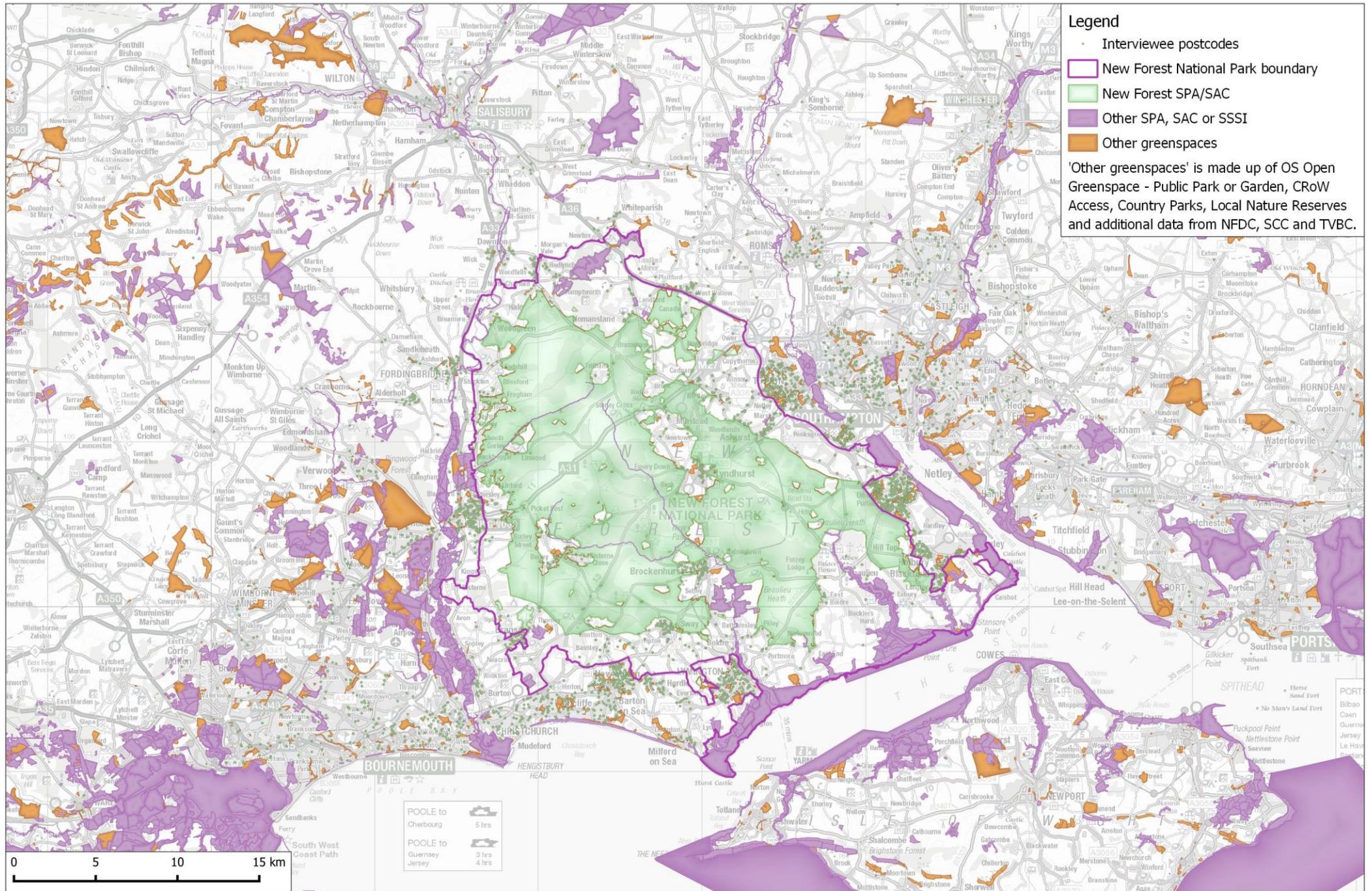
Forest SAC/SPA/Ramsar site, is likely to be particularly successful for these visitors (accounting for around 18% of the total interviewed, from Figure 24 in the on-site visitor report).

- 4.22 Both the telephone survey and the on-site survey generated lists of alternative sites that interviewees used. The on-site report perhaps provides the best indication of the sites that people who visit the New Forest SAC/SPA/Ramsar site actually use, and these sites (ranked by level of use in the survey) included locations such as Hengistbury Head, Lepe Country Park, Southampton Common, Moors Valley Country Park, Testwood Lakes, Avon Heath Country Park, Queen Elizabeth Country Park and Farley Mount Country Park. These all therefore provide examples of locations that that could be enhanced further or that might act as models for any new greenspace creation.
- 4.23 Maps 6 and 7 show the network of existing alternative greenspace opportunities besides the New Forest SAC/SPA/Ramsar site. The two maps are similar, however Map 7 includes the home postcodes of interviewees from the on-site survey. The data received from New Forest District Council, Southampton City Council and Test Valley Borough Council includes 314 sites within 10km of the New Forest SAC/SPA/Ramsar site, of which 75 sites have an area of at least 25ha. It can be seen from Map 7 that there currently appears to be clusters of postcodes around locations such as Romsey, Totton, Lymington, New Milton, Christchurch and Fordingbridge with relatively little in the way of greenspaces (coloured in orange).
- 4.24 The results from question 21 in the on-site survey (see Figure 14) provide some indications of the kind of features that new greenspace could contain in order to draw users. The top three answers were refreshments, extensive or good walking routes and a natural feel.
- 4.25 The route data from the on-site survey provide useful data on what extensive good walking routes might need to include. The median route length for dog walkers was around 2.8km and for walkers 3.3km.
- 4.26 It is noteworthy that many of the more significant greenspaces around the New Forest SAC/SPA/Ramsar site charge for parking – for example Moors Valley Country Park or Lepe Country Park. Any new greenspace or changes to greenspaces should ideally ensure they are cheaper to visit than the New Forest SAC/SPA/Ramsar site.

Map 6: Location of existing greenspaces close to the New Forest SPA/SAC



Map 7: Location of existing greenspaces close to the New Forest SPA/SAC with interviewee postcodes (those travelling from home only)



Access management within the New Forest SAC/SPA/Ramsar

4.27 These options relate to new or improved facilities and physical changes 'on the ground', within the New Forest SAC/SPA/Ramsar and designed to reduce impacts of recreation. Options (in no particular order) include:

- **Revisions to parking**, e.g. moving, enlarging or closing some car parks (seasonally or permanently) whilst maintaining overall capacity – to reduce use of sensitive areas; some parking infrastructure such as height restriction barriers or entrances to limit types of vehicles that can use certain car parks (e.g. limiting van access¹³); possibility to charge for parking at some locations to influence where people park.
- **Improved visitor facilities at selected robust sites** (improved maintenance of car parks, toilets, ice cream vans, visitor information, ranger presence, dog off-lead exercise areas).
- **Management of paths and tracks** to focus cyclists and walkers on selected routes and create 'wildlife refuge areas' with minimal disturbance (e.g. agreeing a more functional network of preferred routes and associated signage, perhaps with fences/barriers, ditches or removal of bridges across streams and wetland)
- **Changes in legislation** (e.g. designate the open Forest as CROW Access Land to restrict dog walking during the nest period; update byelaws to restrict commercial activities; additional traffic regulation to control verge parking).

4.28 At the workshop held in July 2019, key points relating to access management within the New Forest SAC/SPA/Ramsar included:

- General support for reviewing car park distribution and the capacities of different car parks, closing/reducing car parking capacity in sensitive areas and/or sensitive times of the year;
- Alongside the above, facilities (toilets, ice-cream vans) as further means of focussing access within the New Forest SAC/SPA/Ramsar site;
- Suggestions to move towards car park charging;
- Greater focus to control/reduce verge parking, including through enforcement;
- Review of bridges and the path network with the potential to manipulate ease of access to different areas (recognising need of access for commoners);

¹³ Limiting van access may help maintain capacity on busy days or certain sites, e.g. where camper vans park so as to be orientated sideways on to a lawn or pool.

- Dead-hedging and use of cut material, brash etc. provides a further means to subtly divert access;
- Face-face (ranger) presence another means to direct access and promote good behaviour;
- There was a suggestion that the inclosures could be promoted and access more concentrated in these areas, particularly dog walking;
- Support for a mechanism to ensure dogs on leads could be enforced, potentially through designating the open Forest as CROW¹⁴ Access Land to restrict dog walking during the nest period.

Insights from the survey results

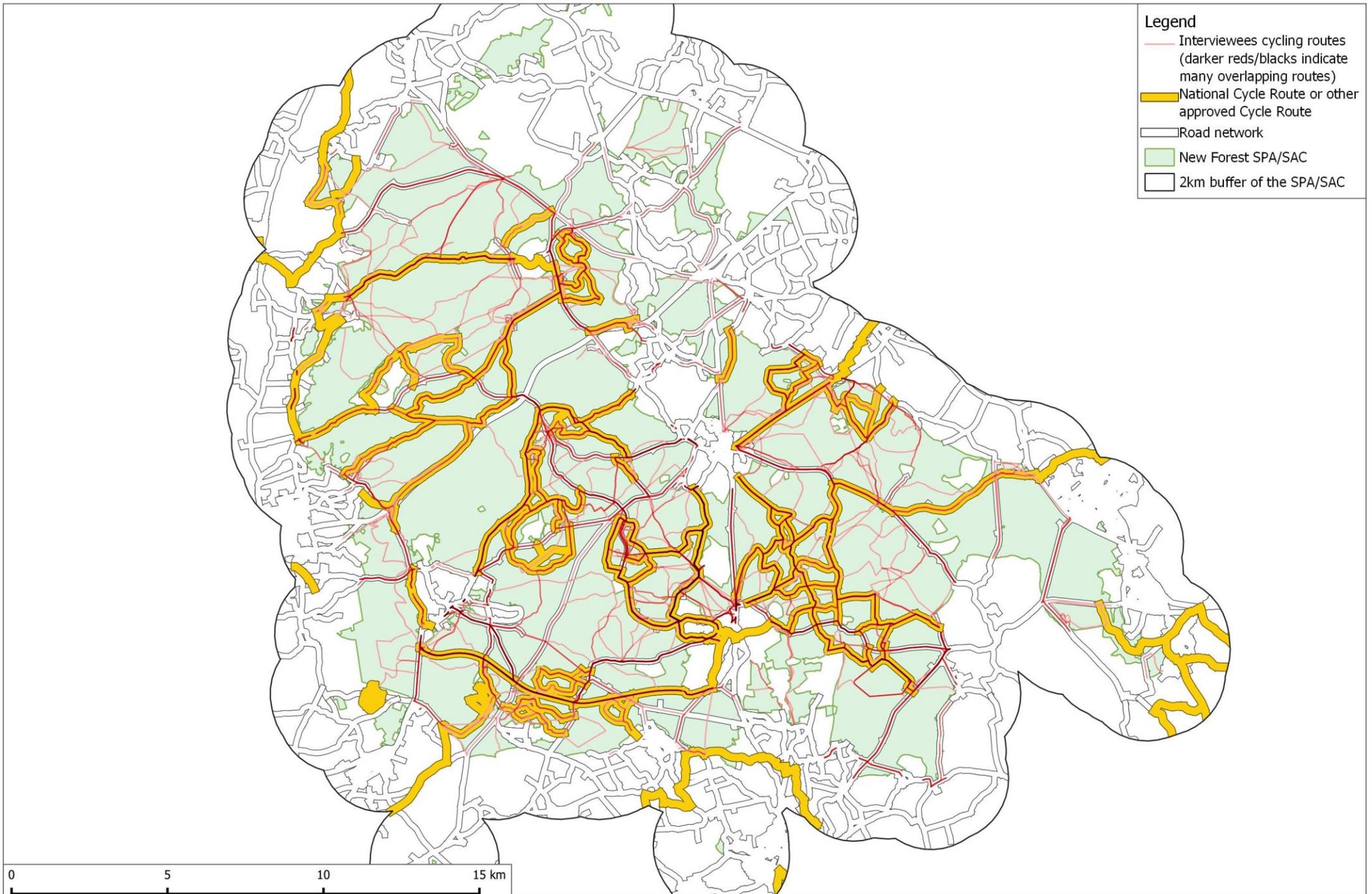
- 4.29 The visitor survey results provide some information which will help to target and tailor on-site management.
- 4.30 Around 8% of interviewees in the on-site survey chose to visit the interview location that day because of the choice of routes available. Around 2% of interviewees chose locations based on the quality of the paths and avoiding mud.
- 4.31 The route data, as mapped from the on-site survey, provide information on where people went during their visit. There is scope to interrogate these data at individual access points to review options for managing the path network at specific locations.
- 4.32 Cyclists are a group where use of designated routes is of interest. The cycle routes are shown in Map 6 in the on-site report: this shows all those who were cycling and this indicates cycle use much more focussed along particular routes than the maps for the other activities. The same route data for cyclists are also shown in Map 8 (below), here using red lines, with the intensity of the red colour reflecting levels of use. These are shown on top of the road network (white) and National Cycle Routes/approved cycle routes¹⁵ in yellow. This allows us to visualise where cyclists have been recorded away from dedicated routes (i.e. where red lines are over the green background) and therefore where there could be opportunities for measures to be put in place. These locations include just north of Denny Wood, Beaulieu Heath, Wilverley Plain and the northern corner, south of the B3078 and north of Abbotswell/Fritham.

¹⁴ The Countryside and Rights of Way Act 2000

¹⁵ Note this does not include bridleways.

- 4.33 95% of interviewees who were off road cyclists/ mountain bikers used the National Cycle Routes or other approved cycle routes at some point (for on road cyclists this was 86%). Other key groups who used these routes were: runners (70%); horse riders (58%); Duke of Edinburgh groups (57%) and walkers (57%). The average length of route for those who used the approved cycle routes was 9,171 m for off road cyclists/ mountain bikers and 6,568 m for road cyclists. Using the total route length across all interviewees, roughly 63% of the off-road cyclists'/mountain bikers' route length was on the cycle routes, while this was no more than 39% for any other categories, including 35% for on road cycling.

Map 8: Distribution of the Cycle Route network through the New Forest overlaid with interviewee cycling routes.



- 4.34 Mitigation options relating to car parks could include changing the distribution of car parks, modifying capacity at different locations, additional infrastructure (height restriction bars, measures to influence how people orientate the vehicles), charging etc. Such measures need to be carefully reviewed, selected and supported by evidence, but there is clearly potential to change the distribution and volume of visitor pressure at different locations through changes to parking. Reducing the overall volume of cars would be beneficial for a wide range of reasons.
- 4.35 Many of the greenspaces around the SAC/SPA/Ramsar site charge for parking. Furthermore, there is a charge to park in the town and village centre car parks within the New Forest. As such, the SAC/SPA/Ramsar site is relatively unique in offering free parking to visitors. The lack of parking charges may help instil in visitors a sense that the open Forest is a free for all, and that there are no restrictions.
- 4.36 As part of the preparatory work to undertake the vehicle counts, we collated GIS data on the number of parking locations providing access to the New Forest SAC/SPA/Ramsar. This included all formal parking locations and lay-bys, gateways and other informal parking areas that were clearly used for parking. While this doesn't include the town centre car parks, the lay-bys on the A31, camp-sites and other parking linked to holiday accommodation and open verges where people stop at random, it represents the majority of the parking available for day-visitors.
- 4.37 We estimate the overall parking capacity to be 270 locations and 4,813 spaces. 147 of the locations (54%) are formal car parks and these account for around 4,442 spaces (92%). Looking at the count data from the vehicle surveys, the Easter Sunday count provided an exceptionally high count on a day when warm sunshine coincided with the bank holiday weekend. Such spikes in visitor numbers, at a time when many species of bird are settling on territory or just starting to incubate may have particular implications for bird disturbance.
- 4.38 On that busy Easter Sunday we counted 2,908 parked vehicles, this was around 60% of the available parking capacity. Notably, that Easter peak was around 10x that of the previous count and indicates the very marked spikes in access that can occur. Even with such peaks, it is interesting to note that there is apparently some further capacity still available and therefore potentially more parking spaces than are necessary. However, it is important

to be cautious when considering the implications of these percentages for car park management.

- 4.39 We predict access levels to increase by around 11% by 2036 as a result of housing development within a 25km radius of the New Forest SAC/SPA/Ramsar site. This increase does not take into account changes in tourist numbers or visitors from further afield than 25km. If vehicle levels were to increase by a further 20%, this would mean around 73% of parking spaces would be filled on a similar very busy day.
- 4.40 A further factor is that our capacity estimates are based on how many cars each car park can accommodate if people parked in an orderly fashion. On the Easter Sunday there were a high proportion of campervans and motorhomes and many of these were parked orientated towards a view or to allow an awning to be put up on the grass (Figure 8). These would then take up more than one parking space. As such, many car parks potentially felt more crowded on that Easter Sunday than perhaps the numbers suggest. It may be that the level of parking provision overall, across the New Forest SAC/SPA/Ramsar site is such that it may be approaching capacity on busy days in the future. This is likely to mean there will further problems in the future, full car parks will displace visitors to park on verges, gateways etc.



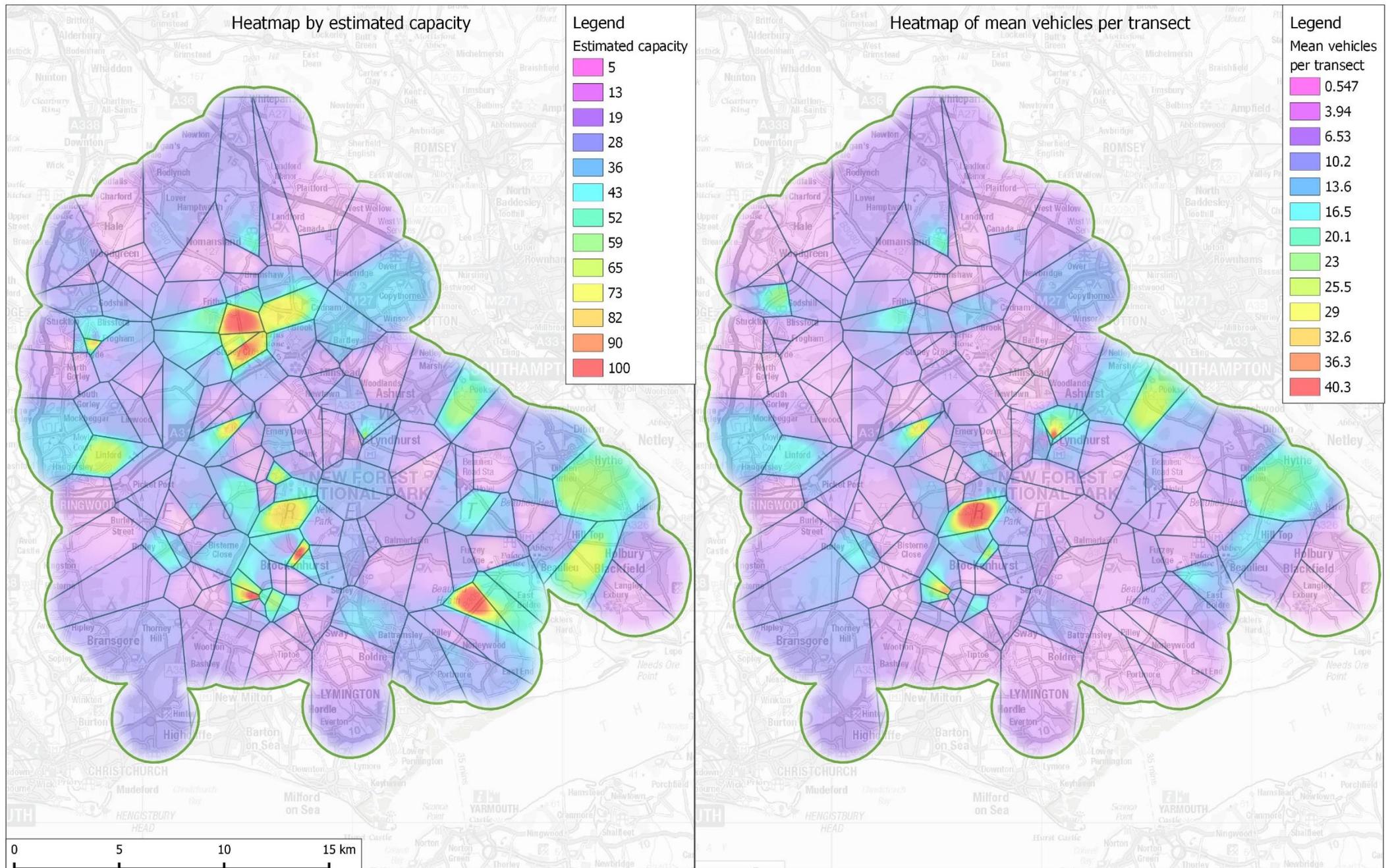
Figure 8: Janesmoor car park on the Easter Sunday. The top image is taken at 90° to the main image

- 4.41 Maps 9 and 10 show Voronoi (also called Thiessen) polygons, drawn around car parks. These polygons indicate the area that is closer to the given car park than another car park. The maps therefore essentially divide the New Forest SAC/SPA/Ramsar site and adjacent areas according to the nearest car park. These Voronoi polygons show that no part of the New Forest SAC/SPA/Ramsar is more than 3km from a parking locations and most of the area is within 2km of a parking location. Given the route lengths and penetration distances highlighted in the interview data – with typical walking routes reaching 1km from the car park (the median, 50% of interviewees) – it is clear that the current distribution of parking means few areas are quiet. Changing car parking will however provide a means to create quieter areas with reduced access.
- 4.42 In Map 9, the shading on the two plots indicate the amount of parking spaces (capacity) available at each car park and the mean number of vehicles actually counted from the transects. If visitors were to choose to park according to where there were parking spaces we would expect the two

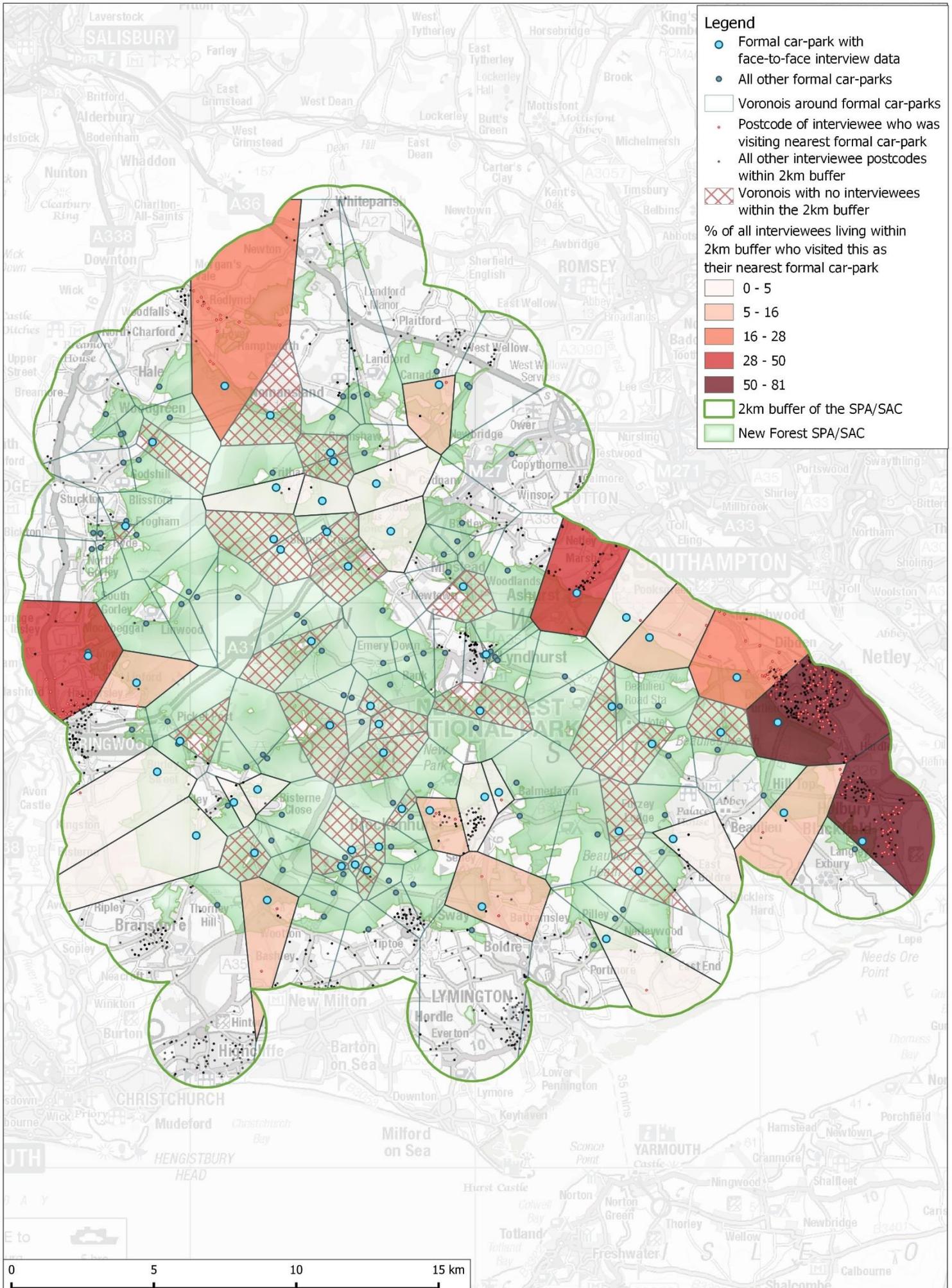
plots to be similar. In fact, it would appear that capacity is very evenly distributed, but typical use is much more concentrated at particular locations. The vehicle counts and information on the spatial distribution of parking locations and areas that are sensitive could provide the basis for a systematic review of parking options and management of parking across the New Forest SAC/SPA/Ramsar site.

- 4.43 Map 10 shows interview postcodes (those arriving by car only) and allows us to identify which car parks have high proportions of people who are visiting the nearest car park to where they live. In the map the darker shades of red indicate car park Voronois where a high proportion of those interviewed (who arrived by car) were choosing their nearest car park (within the New Forest SAC/SPA/Ramsar). On average 24% of interviewees who lived within 2km of the New Forest SAC/SPA/Ramsar site and had travelled by car, had visited their nearest formal car park. The highest recorded was 81%, for survey point 11 (Blackwell Common).
- 4.44 It can be seen that on the eastern edge in particular, around Hythe and towards Fawley, many of the visitors are choosing their nearest car park within the New Forest SAC/SPA/Ramsar site. The Voronois with red cross-hatching are those where no interviewees within a 2km radius had arrived by car and lived within the Voronoi. These are the more central locations within the New Forest SAC/SPA/Ramsar site. Those Voronoi polygons without red hatching or red shading are drawn around those car parks where we did not undertake any interviews. Where these polygons have lots of dots (which represent the postcodes), it suggests locations where local residents were interviewed, had travelled by car and had not chosen to visit their nearest car park. Highcliffe, Lymington, Bransgore and the southern part of Ringwood are notable in this respect, and the data would suggest residents here do not visit their nearest car park in the New Forest SAC/SPA/Ramsar site.

Map 9: Voronois around formal car parks, coloured by a heatmap (inverse distance weighted raster) to show estimated formal car park capacity and mean vehicles per transect from the driving transect.



Map 10: Voronoi around formal car-parks categorised by the percentage of interviewees traveling by car who visited their nearest formal car-park.



Educational and communications activities, both within and outside the New Forest SAC/SPA/Ramsar

4.45 These types of measures encourage responsible recreation, e.g. through websites, social media, leaflets and other publications, posters and signage, exhibitions, film, art, face-to-face communication and enforcement. Options include:

- **Better information and interpretation** about the things that make the designated sites special (especially wildlife and the vital role of commoning) and their vulnerability to harm from recreation. This could include the promotion of agreed key, consistent messages by people and organisations that actively promote the New Forest as a destination.
- **Guided walks and themed events and activities** run by local knowledgeable people to give local people and visitors authentic experiences and first-hand contact with wildlife and the working Forest
- **Promotion of walking routes in robust locations** (e.g. circular routes outside of designated sites, or seasonal promotion to draw people away from more sensitive areas)
- **Activities and projects to encourage health-enhancing and responsible outdoor recreation** close to where people live, e.g. walking for health, health volunteering and outdoor therapy
- **Face-to-face, on site contact with an increased number of rangers** (including apprentices and seasonal staff), other staff that work 'in the field', trained volunteers and well-informed local people
- **Appropriate and proportionate enforcement** (to address illegal recreation-related activities including parking on open Forest verges, dropping litter, flying of drones where this is not allowed, wild camping, lighting fires, commercial fungi picking, parking in car parks overnight, cycling off the permitted network and out of control dogs)
- **Well designed and coordinated educational campaigns** (including with local schools and colleges) to address the most significant and widespread negative impacts such as disturbance of ground nesting birds, feeding ponies and donkeys, animal accidents on unfenced roads and litter
- **Improved management of commercial activities, organised activities and larger events** (including use of voluntary charters and updated permissions and licencing systems)
- **Activities that inspire young people** to respect and care for the Forest by creating opportunities for them to learn about, get

involved with and benefit from the National Park (e.g. through local schools and colleges, wild play sites and countryside events, youth groups, training and creative, jointly-run schemes and awards).

4.46 At the workshop held in July 2019, key points relating education and communication included:

- A mixed approach of measures is important;
- Education programmes should be targeted towards the different user groups (e.g. daily/local versus less regular/longer distance visitors);
- Use of on-the-ground rangers at key locations/peak periods to promote desirable behaviours/routes amongst users, potentially comprising a core of full-time staff alongside seasonal volunteers (building on the ranger resource in the New Forest National Park (NFNP) including that already funded through financial contributions from development in the National Park Authority and New Forest District Council areas);
- Reinforcement of the special nature of the NFNP as visitors enter the New Forest, using signs that highlight the biodiversity (rather than amenity) value of the site;
- Changes in the language and message used on signage and education material to give greater emphasis to the nature conservation importance, for example minimising emphasis or use of the word “park” and increasing recognition of the international importance of NFNP habitats;
- Positive reinforcement of good behavioural practices, and clear and consistent messaging, across any signage or interpretation boards;
- Enforcement of existing byelaws.
- Use of social media, especially for visitors.

Insights from the survey results

4.47 In general, the visitor survey results seem to indicate that the concerted efforts over recent years to raise awareness of ground-nesting birds and disturbance issues have been effective to some extent. Only 22% of interviewees in the on-site survey were not aware of any wildlife habitats or species that could be affected by people and 67% named a species or habitat. Around 40% of interviewees mentioned breeding birds or ground-nesting birds. Regular visitors were more ‘aware’ than less regular visitors.

4.48 Reviewing the data for dogs on leads – at least as seen by the surveyor while conducting the interview – indicates that there were a significantly higher proportion of interviewees seen with dogs on leads during the spring (when

43% of dogs on leads) and summer (45% on leads) compared to the winter (35% on leads) ($\chi^2=32.28$, $p<0.001$). This would suggest that the relatively high awareness, at least to some extent, also translates to a change in behaviour.

- 4.49 This relatively high level of awareness would suggest that communication and awareness raising approaches used to date have – at least to some extent - been successful. It is interesting to note that relatively few interviewees indicated that they had used information to plan their visit (see table 9 in the visitor survey report). For example, maps were the most frequently cited information source, used by 15% of interviewees. This perhaps highlights the key role that an on-site information can play, such as signage and the presence of on-site staff. Signage is used relatively widely in the New Forest (e.g. Figure 7b) and there are existing ranger teams that work together in the New Forest. There is scope for both approaches to be further expanded as mitigation. There is much local experience and expertise in such approaches as mitigation, for example education and awareness raising are key components of the mitigation approach for the Solent (with 7 rangers employed by Bird Aware Solent over the winter 2019/20).

Other Measures: distribution of housing

- 4.50 One approach to avoiding impacts would be to limit the overall levels of new housing close to the New Forest SAC/SPA/Ramsar site, through policy identifying areas where there is a presumption against development. This would need to be considered through the Local Plan-making process undertaken by the respective planning authorities. As the modelling work shows, small numbers of houses within the first kilometre or two from the New Forest SAC/SPA/Ramsar site boundary have a disproportionate effect in terms of increased recreation use.

Insights from the survey results

- 4.51 The modelling work considered the change in housing around the surveyed access points and the implication of that change for those survey points only. That modelling predicted that one dwelling in the 0-1km band around a given access point will, on average, generate a similar number of visits (to that access point) as 10 dwellings at 5km or over 90 dwellings at 10km.

4.52 Furthermore, development very close to the European site boundary will be much harder to mitigate. With development in close proximity it is harder to deflect access with alternative greenspace, as there is little scope to intercept visitors or provide significant alternatives. Mitigation approaches such as access management and wardening are likely to be less relevant as it is harder to intercept visitors who enter from multiple informal access points and are likely to use the heath at a wide range of times of day (and even during the night). Such use will be by people who have the greenspace literally on their doorstep – their de facto space to use and potentially seen as an extension to their garden. That will differ from the use by people who travel to the site and make an effort to visit, potentially driving and arriving at a main car park.

Monitoring

4.53 Monitoring is important to help inform measures and pick-up issues as they emerge. Monitoring is an important component of mitigation as it can pick-up emerging issues and help target resources efficiently. Strategic mitigation in other areas such as Dorset and the Solent have monitoring strategies which review existing monitoring and identify future monitoring actions that are aligned to the mitigation (e.g. D. Liley, Stillman, Austin, & Panter, 2016; Panter & Liley, 2017). Monitoring options in the New Forest SAC/SPA/Ramsar site include:

- **Regular vehicle counts** (as conducted for this project or alternatively through the use of automated counters), to check changes in use and redistribution of vehicles;
- **Regular counts of people, dogs, dogs off-leads, horses and cycles** at carefully selected locations, potentially undertaken through direct observation or automated counters;
- **Repeat/targeted questionnaire** work to identify awareness of different issues and effectiveness of messaging;
- **Incident monitoring** which would provide systematic data (such that year on year trends can be identified) on fire occurrence, incidents with dogs and livestock, water quality (checking for particular contaminants), dog fouling etc;
- **Ecological monitoring** to ensure information available on the distribution of key species and any emerging issues.

4.54 Given the scale of the New Forest SAC/SPA/Ramsar site and the numbers of people, large surveys are complex to organise and costly. The monitoring necessary as part of a mitigation package does not need to be overly

complex, for example targeted questionnaire work could focus on particular locations and a set number of interviews in order to gather feedback on different messaging. The vehicle counts undertaken as part of this study used 5 surveyors and took around 3-4 hours to complete. As such total counts of parked vehicles across the New Forest can be gathered relatively easily. A regular programme of such snapshot counts could be supplemented with automated counters to generate more detailed counts from selected locations.

- 4.55 Ecological monitoring need not cover all interest features across all areas and instead could be targeted to selected species and particular issues or areas. Such monitoring would need to track trends in key species so that issues with recreation can be picked up and any particularly sensitive locations (which may shift in time and space) are identified. Ground-nesting birds are clearly important and knowing the distribution and trends for these will be one monitoring element. Other ecological monitoring could include Southern Damselfly, perhaps at selected locations (such as around Hatchet Pond or Mill Lawn), verge condition on key verges, spread and occurrence of relevant alien species and scoring/checks of deadwood at selected locations. Fixed point photographs and checks of habitat structure and condition may be useful at some locations.

Summary of mitigation options

- 4.56 Issues associated with recreation in the New Forest SAC/SPA/Ramsar site have long been a cause for concern and the challenge continues to grow to balance recreation provision with protection of rare species and habitats. In the absence of significant mitigation measures increases in housing around the SAC/SPA/Ramsar site in the coming years will exacerbate the issues and result in a marked increase in use and potential impacts on the protected sites.
- 4.57 In order to be confident of resolving the issues it will be necessary for local authorities, alongside other key stakeholders involved in the management of the New Forest SAC/SPA/Ramsar site, to establish a co-ordinated, proportionate, strategic approach to mitigation. Working with the steering group, we have listed a range of mitigation options which fit with the strategic actions identified as part of the work by the National Park Authority and partners to update the Recreation Management Strategy. Such measures could provide the foundation for a strategic approach to mitigation. Many of the measures complement each other and as such they

potentially form a package; none of them would provide effective mitigation if delivered in isolation. The success of a mitigation package is likely to be ensured by having a range of approaches that will maximise the reach of particular messages, reinforce the messages and ensure different user groups and types of activities are included. Most would be necessary as components in a final package and this will require further work by partners and stakeholders to bring together and agree a co-ordinated and proportionate approach.

- 4.58 The alignment with the Recreation Management Strategy is important as mitigation measures will need to fit with existing recreation management and the Recreation Management Strategy provides a framework to help with implementation and delivery. The mitigation measures also represent a legal obligation by which local authorities ensure compliance with the regulations. As such the mitigation must relate to resolving impacts from new housing, fit for purpose and not just recreation management that would be undertaken anyway.
- 4.59 We summarise measures in Table 4, providing an overview of the previous sections of the report. The table includes all the measures identified in bullet points above, with the exception of monitoring, and measures are scored based on some simple categories and metrics. The intention is to show the measures in the round and help highlight those that are likely to be the most effective.
- 4.60 One of the scorings reflects cost, indicating those that will be particularly expensive. Many require detailed work to plan and design, let alone implement. Given the scale of the New Forest SAC/SPA/Ramsar site, the range of issues and the number of stakeholders, a prolonged period is likely to be required before many can be established. We therefore differentiate measures based on timing, highlighting those that are short-term, medium term or long-term in their implementation. Short-term measures are those that can be established promptly – ‘quick wins’ whereas the long-term ones are those that require considerable work to establish. Positive measures are those that enhance access and are likely to be well received by visitors, by contrast negative ones are likely to be opposed and not welcomed by visitors and user groups. Measures are also differentiated based on whether they are potentially best delivered on a per-development basis, at a local authority scale or in a more joined-up strategic approach involving multiple local authorities.

- 4.61 We have also scored effectiveness. We have drawn on expert scores as given in Ross et al. (2014) and also from other published sources, as available. Further information, as relevant, is given in the commentary section of the table. It is important to note that while measures can be ranked and scored, the work by Ross et al. did highlight that many interventions have worked in some areas and not others and that expert scores vary markedly based on their particular experiences. Effectiveness is likely to vary for a range of reasons, for example in relation to the level of resources or the personalities involved. Furthermore, it is often hard to view the effectiveness of a particular measure in isolation. Measures such as rangers, signage, interpretation, education / awareness raising initiatives and changes to access infrastructure to some extent all go hand-in-hand. They reinforce each other and effectiveness will relate to the overall approach and the messages conveyed.

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

Table 4: Summary of mitigation approaches. See body of report for full details. Timing: S (short-term), M (medium-term), L (long-term); Cost: £, ££ or £££ to indicate those that have a low (£) medium (££) or high (£££) cost; Effectiveness: scored 1-3 (3 being most effective). Positive: measures with a ✓ are likely to be well received by visitors and potentially enhance access, those with a ✓? are where there is some doubt, but they could be positive. The Strategic column identifies measures that are best delivered by individual developers (ID), by individual planning authorities (PA) or that are best delivered strategically, i.e. through joint working across multiple authorities (S).

Measure	Timing	Cost	Effectiveness	Positive	Strategic	Commentary
Alternative recreational greenspace sites and routes outside of designated sites						
Improvements to existing greenspaces	M	££	2	✓	PA	Would need to be informed by a review of existing greenspace and detailed considerations of the potential enhancements at each. Effectiveness will be determined by such a review. In particular, effectiveness will be determined by the quality and location of sites and ability for these to be improved to draw more recreation. How existing sites relate to new housing will be critical. Improvements could include free parking, changes to car parking, improved facilities and better routes. Wilder locations with an expansive semi-natural feel will be important.
Provision of new greenspaces within or adjoining residential development sites	M	£££	2	✓	ID, PA	These will be local greenspace sites and will need to be close to people's homes in order to work. They will need to provide an expansive, semi-natural experience in order to draw visitors away from the New Forest SAC/SPA/Ramsar site and are likely to require parking and other infrastructure. The median route length from the visitor survey was 2.8km for dog walkers. As a guide, a square with a perimeter of 2.8km (i.e. potential for route around outer edge) would be 49ha. Such greenspace could be delivered by individual developments (large developments only) or else would require a strategic approach and pooled contributions (hence the 1-2 score in the strategic column).
New 'destination' greenspaces	L	£££	2	✓	S	These would be large, highly promoted sites that would have a wide draw and a large catchment. As such they would need to be established through joint working and some strategic approach. Such sites could provide the opportunity for a wider range of recreational activities than smaller greenspace sites, for example cycling facilities and a range of routes. Cafes and other infrastructure may help to extend the catchment. 'Destination' sites may be less effective in drawing regular dog walkers unless parking is cheaper than other sites and there is suitable space and routes for dog walking.
Designated locations for off-lead dog walking/training and 'bike parks'	M	££	1	✓	PA	These would be dedicated infrastructure aimed at particular user groups and could include commercial ventures on private land. These types of facilities are scored low for effectiveness as they target very particular user groups, and for example the cyclists interviewed in the New Forest SAC/SPA/Ramsar site were visiting to undertake long routes in expansive open countryside rather than seeking particularly technical

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

Measure	Timing	Cost	Effectiveness	Positive	Strategic	Commentary
						routes. There may be scope for bike parks to provide for family cycling/small children and safe routes, but these may be better provided at destination greenspaces. Off-lead dog walking sites need to be very large and are greenspace sites in their own right. Dog training areas are used in SANGs etc in other strategic mitigation schemes and there may be a role for such features – but probably best delivered as part of existing or new greenspace sites where there is also scope to walk the dog.
Improved rights of way	S	£	1	✓	PA, S	This would involve improvements to the path/route network outside the New Forest SAC/SPA/Ramsar site. The effectiveness of such improvements is likely to be entirely down to the scale of works and locations. Narrow linear routes will be unlikely to provide a realistic alternative to the New Forest SAC/SPA/Ramsar site and opportunities may be limited in urban areas (Poole/Bournemouth conurbation, Southampton) or agricultural land (e.g. to the north). Routes would ideally need to be circular and may require provision of parking. Scored with a 2 in the strategic column as improvements would need to be carefully planned and joined-up, potentially on multiple land-holdings. This would be difficult to deliver at a development level and possibly would need to be across different local authorities.
Access management within the designated sites						
Revisions to parking	M	££	3	x	S	This would need to be informed by a detailed review, involving assessment on a car park by car park basis. Redistributing car parking across the New Forest SAC/SPA/Ramsar site and changing the number of spaces in different locations is likely to be the most effective means to redistribute access. It would be possible to limit certain vehicle types at some car parks (e.g. large vans) and it may be possible to create dedicated overflow areas that can be opened on peak days to cope when capacity is stretched. Parking charges could be levied but may not necessarily influence where people go. These kinds of major revisions will require HRA and will need careful planning. Effectiveness overall will be determined by the potential to limit verge parking and the score of 3 for effectiveness depends on limiting verge parking. Given a 3 in the strategic column as will require some kind of joint working and pooled contributions to fund changes within the New Forest SAC/SPA/Ramsar.
Improved visitor facilities at selected robust sites	M	££	1	✓	S	This would require detailed review and careful assessment to identify robust sites. Some of the areas of plantation forestry are likely to provide the most robust locations. Scored as a 1 for effectiveness as currently relatively little facilities at most locations/car parks and so little evidence that improving facilities will help redistribute where people go. Links to promotion (see below) which will also influence effectiveness. Given a 3 in the strategic column as will require some kind of joint working and pooled contributions to fund changes within the New Forest SAC/SPA/Ramsar.

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

Measure	Timing	Cost	Effectiveness	Positive	Strategic	Commentary
Management of paths and tracks	S	£	1	✓?	S	Scope to add further routes and seek to disperse access. Scored as 1 for effectiveness and it may serve to simply add more infrastructure and draw more visitors. There may be opportunities in specific locations where such approaches may work well, for example through the removal of crossing points on streams and dead-hedging etc., but there would then be a need careful checks and monitoring to ensure paths and desire lines do not become re-established.
Changes in legislation	M	£	2	x	S	Depends entirely on the legislation and how enforced, hence the score of 2 for effectiveness. A new traffic regulation/verge protection order that was able to restrict verge parking would be likely to make a major difference. Legislation relating to dogs on leads may be difficult to establish.
Educational and communications activities						
Better information and interpretation	S	£	2	✓	S	This could be provided in a range of ways, including face-face, on-line or physical infrastructure such as interpretation panels or signs. Effectiveness will be dependent on the quality and scale of provision. Likely to be important as a component of any mitigation approach in order to ensure visitors understand the need to behave in a particular way or the reasoning behind particular interventions. Scored as a 2 for effectiveness as relatively little evidence that effective in isolation (e.g. Byers 2003, cited in Williams et al., 2019a).
Guided walks and themed events and activities	S	£	1	✓	S	Events etc may draw more visitors and therefore any programme needs to be carefully promoted and targeted. Face-face contact likely to work well to convey tailored messages and events most likely to work well with particular audiences (e.g. dog walkers).
Promotion of walking routes in robust locations	S	£	2	✓	S	Effectiveness will depend on finding suitable robust locations, how many robust locations are promoted, how well the promotion works and the relevant take-up. The visitor survey data provides some insights into the likely scale, lengths of routes and current route selection (at least at the survey locations).
Activities and projects to encourage health-enhancing and responsible outdoor recreation close to where people live	S	£	1	✓	PA	Health-enhancing activities doesn't necessarily equate to mitigation. Nonetheless, activities and events that are targeted to existing and new greenspaces may help to raise awareness about these sites and help deflect access. Effectiveness will depend on the locations, the activities, promotion and likely to be best utilised as part of a package with other measures (such as the creation/enhancement of green infrastructure).
Face-to-face, on site contact with an increased number of rangers	S	££	3	✓?	S	Rangers are a fundamental element in other strategic mitigation approaches and widely accepted as a means to influence and manage visitor behaviour. Ranger time can be focussed at locations with particular sensitivities or issues and there is scope for wide coverage (Dhanjal-Adams, Mustin, Possingham, & Fuller, 2016). Rangers can fulfil a range of roles, including watching for fires, promoting responsible access, directing visitors and showing visitors wildlife. Cost and effectiveness will depend on the number of rangers.

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

Measure	Timing	Cost	Effectiveness	Positive	Strategic	Commentary
Appropriate and proportionate enforcement	M	£	1	x	S	Effectiveness depends on the issue and the scope to enforce. Likely to be most relevant for dog fouling, dogs off-lead, verge parking and cycling off set routes. Little use unless appropriate legislation in place, hence low score for effectiveness.
Well designed and coordinated educational campaigns	S	£	2	✓	S	Likely to help raise awareness about particular issues (feeding livestock, dogs off leads, verge parking) but may be hard to reach certain audiences. There is some published evidence for the effectiveness of signs and access restrictions in reducing disturbance impacts (Medeiros et al., 2007; Williams et al., 2019b) and also evidence for the effectiveness of education programmes (e.g. Marion & Reid, 2007; Ormsby & Forys, 2010). Some kind of targeted project for dog walkers, perhaps in line with the Dorset Dogs project could be particularly relevant.
Improved management of commercial activities, organised activities and larger events	M	£	1	✓	S	Commercial activities accounted for a relatively small proportion of interviewees (e.g. only 1% of interviewees within on-site survey were part of an organised group of any description) and therefore scored 1 for effectiveness. May have a role within a mitigation package as activities and events may increase with housing and large gatherings of people at a point in space and time could have major impacts. Potential opportunities to convey messages and information to wide audience.
Activities that inspire young people to respect and care for the Forest	M	£	1	✓	S	May help reach wider local audience, but such approaches would need to be targeted towards local families. Few young people visit on their own and only 17% of the interviewees in the on-site survey were part of a group that included any children (hence the effectiveness score of 1). Benefits of engagement with this audience may be the long-term awareness raising and chance to influence the next generation and as such could play a role within a mitigation package.
Other Measures						
Presumption against development/housing distribution	M	£	3	✓	PA	Effectiveness will depend on scale. If only a few 100m then will resolve relatively little of the cumulative impacts as relatively little growth so close to the New Forest SAC/SPA/Ramsar boundary. If growth limited within a 1km or 2km radius then will have a much stronger effect. Scored as medium in terms of timing as the relevant local plans have either recently been adopted or will be very soon.

5. References

- Balmer, D. E., Gillings, S., Caffrey, J. M., Swann, B., Downie, I., & Fuller, R. (2013). *Bird Atlas 2007-11 the breeding and wintering birds of Britain and Ireland*. Thetford, Norfolk: BTO.
- Banks, P. B., & Bryant, J. V. (2007). Four-legged friend of foe? Dog-walking displaces native birds from natural areas. *Biology Letters*, 3(6), 611–613.
- Beale, C. M., & Monaghan, P. (2004). Human disturbance: people as predation-free predators? *Journal of Applied Ecology*, 41(2), 335–343.
- Beale, C. M., & Monaghan, P. (2005). Modeling the Effects of Limiting the Number of Visitors on Failure Rates of Seabird Nests. *Conservation Biology*, 19, 2015–2019.
- Bellamy, P. (2015). *Can't see the wood for the trees! Understanding woodland bird declines* (Case Study No. 17). Sandy, Beds.: RSPB Centre for Conservation Science.
- Bellamy, P. E., Burgess, M. D., Mallord, J. W., Cristinacce, A., Orsman, C. J., Davis, T., ... Charman, E. C. (2018). Nest predation and the influence of habitat structure on nest predation of Wood Warbler *Phylloscopus sibilatrix*, a ground-nesting forest passerine. *Journal of Ornithology*, 159(2), 493–506. doi: 10.1007/s10336-017-1527-7
- Bellefleur, D., Lee, P., & Ronconi, R. A. (2009). The impact of recreational boat traffic on Marbled Murrelets (*Brachyramphus marmoratus*). *Journal of Environmental Management*, 90(1), 531–538. doi: 10.1016/j.jenvman.2007.12.002
- Brambilla, M., Rubolini, D., & Guidali, F. (2004). Rock climbing and Raven *Corvus corax* occurrence depress breeding success of cliff-nesting Peregrines *Falco peregrinus*. *Ardeola*, 51(2), 425–430.
- Brawn, J., Robinson, S., & Ill, F. T. (2001). The role of disturbance in the ecology and conservation of birds. *Annual Review of Ecology and Systematics*, 32(2001), 251–276.
- Bullock, J. M., & Webb, N. R. (1995). Responses to severe fires in heathland mosaics in Southern England. *Biological Conservation*, 73(3), 207–214. doi: 10.1016/0006-3207(94)00110-C
- Cavalli, M., Baladrón, A. V., Isacch, J. P., Biondi, L. M., & Bó, M. S. (2016). Differential risk perception of rural and urban Burrowing Owls exposed to humans and dogs. *Behavioural Processes*, 124, 60–65. doi: 10.1016/j.beproc.2015.12.006

- Cavan, G., & McMorrow, J. (2009). *Interdisciplinary Research on Ecosystem Services: Fire and Climate Change in UK Moorlands and Heaths. Summary report prepared for Scottish Natural Heritage*. SNH.
- Chatters, C., & Kernohan, R. (2031). *Avon Water Studies: Two studies of land-use and land ownership change in the New Forest National Park*. Hampshire and Isle of Wight Wildlife Trust.
- Clements, R. (2019). Dartford Warbler study 2018. In *Hampshire Bird Report 2018* (pp. 216–219). Hampshire Ornithological Society.
- Cox, J. (1996a). *A preliminary assessment of proposed changes in camping and car park provision in the New Forest* [Unpublished report for the New Forest Association and the Hampshire Wildlife Trust].
- Cox, J. (1996b). *New Forest Rivers: Policies and Issues* [Unpublished report for the Hampshire and Isle of Wight Wildlife Trust].
- Dhanjal-Adams, K. L., Mustin, K., Possingham, H. P., & Fuller, R. A. (2016). Optimizing disturbance management for wildlife protection: the enforcement allocation problem. *Journal of Applied Ecology*, 53(4), 1215–1224. doi: 10.1111/1365-2664.12606
- Edgar, P. (2002). *The effects of public access on amphibians and reptiles. an assessment of the potential effects of increased public access due to the introduction of the countryside and rights of way act 2000*. Retrieved from CCW Contract Science website:
file:///S:/reports%20%26%20pdfs/Papers%20linked%20to%20Endnote/Edgar,%20public%20access%20on%20Amphibians%20and%20Reptiles%20(CS_478).pdf
- Egli, S., Peter, M., Buser, C., Stahel, W., & Ayer, F. (2006). Mushroom picking does not impair future harvests – results of a long-term study in Switzerland. *Biological Conservation*, 129(2), 271–276. doi: 10.1016/j.biocon.2005.10.042
- Ellenberg, U., Mattern, T., & Seddon, P. J. (2013). Heart rate responses provide an objective evaluation of human disturbance stimuli in breeding birds. *Conservation Physiology*, 1(1), cot013–cot013. doi: 10.1093/conphys/cot013
- Fearnley, H., Hoskin, R., Liley, D., White, J., & Lake, S. (2012). *Urban development and the New Forest SPA*. Footprint Ecology/ New Forest National Park Authority.
- Fernandez-Juricic, E., Jimenez, M. D., & Lucas, E. (2001). Alert distance as an alternative measure of bird tolerance to human disturbance: implications for park design. *Environmental Conservation*, 3, 263–269.

- Glover, J. (2019). *Landscapes review: National Parks and AONBs* [Independent review commissioned by the Department for the Environment, Food and Rural Affairs]. DEFRA.
- Goater, R. D., Houghton, D., & Temple, C. (2004). *The New Forest Breeding Waders Survey 2004; a survey of breeding waders in the New Forest Valley Mires, Hampshire*. RSPB / New Forest LIFE partnership.
- Grant, M. J., & Edwards, M. E. (2008). Conserving idealized landscapes: past history, public perception and future management in the New Forest (UK). *Vegetation History and Archaeobotany*, 17(5), 551–562. doi: 10.1007/s00334-007-0100-3
- Hampshire Ornithological Society. (2015a). *Hampshire Bird Atlas 2007-2012* (J. Eyre, Ed.). Hampshire Ornithological Society.
- Hampshire Ornithological Society. (2015b). *Hampshire Bird Report 2013*. Hampshire Ornithological Society.
- Hampshire Ornithological Society. (2015c). *Hampshire Bird Report 2014*. HAMPSHIRE ORNITHOLOGICAL.
- Hampshire Ornithological Society. (2016). *Hampshire Bird Report 2015*.
- Hampshire Ornithological Society. (2018). *Hampshire Bird Report 2017*. Dorchester.
- Hampshire Ornithological Society. (2020). *Woodlark Survey 2019*. Unpublished report by the Hampshire Ornithological Society for the Verderers of the New Forest.
- Hill, D., Hockin, D., Price, D., Tucker, G., Morris, R., & Treweek, J. (1997). Bird disturbance: Improving the quality and utility of disturbance research. *Journal of Applied Ecology*, 34((2)), 275–288.
- Hockin, D., Ounsted, M., Gorman, M., Hill, D., Keller, V., & Barker, M. A. (1992). Examination of the effects of Disturbance on birds with reference to its importance in Ecological Assessments. *Journal of Environmental Management*, 36, 253–286.
- Holling, M., & Rare Breeding Birds Panel. (2018). Rare breeding birds in the UK in 2016. *British Birds*, 111(November), 644–694.
- HOS. (2019). *Wader Survey 2019*. Unpublished report by the Hampshire Ornithological Society for the Verderers of the New Forest.
- ICF GHK. (2013). *The economic impact of Natural England's National Nature Reserves* (Natural England Commissioned Report No. NECR131).
- ICRT. (2011). *The Economic Potential of Nature Tourism in Eastern Yorkshire* (p. 61). Retrieved from <http://mediafiles.thedms.co.uk/Publication/YS->

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

EY/cms/pdf/YNT%20ICRT%20Report,%20Nature%20Tourism%20in%20Eastern%20Yorkshire.pdf

- Jackson, S. (2018). *Survey and assessment of Nightjar *Caprimulgus europaeus* status in the New Forest*. Unpublished report by Arcadian Ecology for the Verderers of the New Forest.
- Kays, R., Parsons, A. W., Baker, M. C., Kalies, E. L., Forrester, T., Costello, R., ... McShea, W. J. (2017). Does hunting or hiking affect wildlife communities in protected areas? *Journal of Applied Ecology*, 54(1), 242–252. doi: 10.1111/1365-2664.12700
- Keniger, L. E., Gaston, K. J., Irvine, K. N., & Fuller, R. A. (2013). What are the Benefits of Interacting with Nature? *International Journal of Environmental Research and Public Health*, 10(3), 913–935. doi: 10.3390/ijerph10030913
- Lafferty, K. (2001). Birds at a Southern California beach: seasonality, habitat use and disturbance by human activity. *Biodiversity and Conservation*, 10(11), 1949–1962.
- Lee, A. C. K., & Maheswaran, R. (2011). The health benefits of urban green spaces: a review of the evidence. *Journal of Public Health*, 33(2), 212–222. doi: 10.1093/pubmed/fdq068
- Legg, C. J., & Davies, M. (2009). What determines fire occurrence, fire behaviour and fire effects in heathlands? *Proceedings of the 10th National Heathland Conference - Managing Heathlands in the Face of Climate Change*, 45–55. York: Natural England Commissioned Report NECR014.
- Liddle, M. J. (1997). *Recreation Ecology*. London: Chapman & Hall.
- Liley, D., & Fearnley, H. (2012). *Poole Harbour Disturbance Study*. Footprint Ecology / Natural England.
- Liley, D., & Fearnley, H. (2014). *Trends in Nightjar, Woodlark and Dartford Warbler on the Dorset Heaths 1991-2013*. Footprint Ecology / Birds of Poole Harbour.
- Liley, D., Lake, S., Underhill-Day, J., Sharp, J., White, J., Hoskin, R., ... Fearnley, H. (2010a). *Welsh Seasonal Habitat Vulnerability Review*. Footprint Ecology / CCW.
- Liley, D., Lake, S., Underhill-Day, J., Sharp, J., White, J., Hoskin, R., ... Fearnley, H. (2010b). *Welsh Seasonal Habitat Vulnerability Review*. Footprint Ecology / CCW.
- Liley, D., Stillman, R., Austin, G., & Panter, C. (2016). *Advice on how to evaluate the effectiveness of the Solent Recreation Mitigation Strategy* (Unpub. No. 288). Footprint Ecology / Solent Recreation Partnership.
- Liley, Durwyn, & Sutherland, W. J. (2007). Predicting the population consequences of human disturbance for Ringed Plovers *Charadrius hiaticula*: a game theory approach. *Ibis*, 149(s1), 82–94. doi: doi:10.1111/j.1474-919X.2007.00664.x

- Lowen, J., Liley, D., Underhill-Day, J., & Whitehouse, A. T. (2008). *Access and Nature Conservation Reconciliation: supplementary guidance for England*. Retrieved from internal-pdf://NECR013 Access and N C Reconciliation - Supp Guidance-2802587904/NECR013 Access and N C Reconciliation - Supp Guidance.pdf
- Mallord, J. W., Smith, K. W., Bellamy, P. E., Charman, E. C., & Gregory, R. D. (2016). Are changes in breeding habitat responsible for recent population changes of long-distance migrant birds? *Bird Study*, 63(2), 250–261. doi: 10.1080/00063657.2016.1182467
- Marion, J. L., & Reid, S. E. (2007). Minimising Visitor Impacts to Protected Areas: The Efficacy of Low Impact Education Programmes. *Journal of Sustainable Tourism*, 15(1), 5–27. doi: 10.2167/jost593.0
- Martin, R. H., Butler, D. R., & Klier, J. (2018). The influence of tire size on bicycle impacts to soil and vegetation. *Journal of Outdoor Recreation and Tourism*, 24, 52–58. doi: 10.1016/j.jort.2018.08.002
- Marzluff, J. M., & Neatherlin, E. (2006). Corvid responses to human settlements and campgrounds: causes, consequences and challenges for conservation. *Biological Conservation*, 130, 301–314.
- Medeiros, R., Ramosa, J. A., Paivaa, V. H., Almeida, A., Pedroa, P., & Antunes, S. (2007). Signage reduces the impact of human disturbance on little tern nesting success in Portugal. *Biological Conservation*, 135(1), 99–106.
- Messenger, A., & Roome, M. (2007). The breeding population of the Hobby in Derbyshire. *British Birds*, 100, 594–608.
- Mulero-Pázmány, M., Jenni-Eiermann, S., Strelbel, N., Sattler, T., Negro, J. J., & Tablado, Z. (2017). Unmanned aircraft systems as a new source of disturbance for wildlife: A systematic review. *PLOS ONE*, 12(6), e0178448. doi: 10.1371/journal.pone.0178448
- New Forest Joint Steering Committee. (1971). *Conservation of the New Forest*.
- New Forest npa. (2016). *New Forest State of the Park Report 2016*. New Forest National Park Authority.
- NFNPA. (2010). *New Forest National Park Recreation Management Strategy 2010-2030*. New Forest National Park Authority.
- Ormsby, A. A., & Forsys, E. A. (2010). The Effects of an Education Campaign on Beach User Perceptions of Beach-Nesting Birds in Pinellas County, Florida. *Human Dimensions of Wildlife*, 15(2), 119–128. doi: 10.1080/10871200903428366
- Panter, C., & Caals, Z. (in prep). *Urban Heaths Partnership Annual Monitoring Report 2018-19*. Unpublished report for the Urban Heaths Partnership.

- Panter, C., Lake, S., & Liley, D. (2016). *Southern Damselfly monitoring results 2015 and 2016*. Footprint Ecology/Natural England.
- Panter, C., & Liley, D. (2017). *Update on the Dorset Heathland Implementation Group Monitoring Framework*. Footprint Ecology on behalf of the Urban Heaths Partnership.
- Pascoe, C. (n.d.). *Factors Affecting the Distribution of *Spiranthes spiralis* and *Gentianella campestris* on Wilverley Plain in the New Forest* (BSc). University of Reading, Reading UK.
- Pienkowski, M. J. (1984). Breeding biology and population dynamics of Ringed Plovers *Charadrius hiaticula* in Britain and Greenland: nest predation as a possible factor limiting distribution and time of breeding. *Journal of the Zoological Society of London*, 202, 83–114.
- Pretty, J., Griffin, M., Peacock, J., Hine, R., Selens, M., & South, N. (2005). A countryside for health and well-being: the physical and mental health benefits of green exercise. *Countryside Recreation*, 13(1), 2–7.
- Rand, M., & Mundell, A. R. G. (2011). *Hampshire Rare Plant Register*. Trollius Publications.
- Richardson, M., Cormack, A., McRobert, L., & Underhill, R. (2016). 30 Days Wild: Development and Evaluation of a Large-Scale Nature Engagement Campaign to Improve Well-Being. *PLOS ONE*, 11(2), e0149777. doi: 10.1371/journal.pone.0149777
- Roberts, S. J., Lewis, J. M. S., & Williams, I. T. (1999). Breeding European Honey buzzards in Britain. *British Birds*, 92(7), 326–345.
- Rose, R., & Clarke, R. (2005). *Urban impacts on Dorset heathlands: Analysis of the heathland questionnaire survey and heathland fires incidence data sets*. Peterborough: English Nature.
- Ross, K., Liley, D., Austin, G., Clarke, R. T., Burton, N. H., Stillman, R. A., ... Underhill-Day, J. (2014). *Housing development and estuaries in England: developing methodologies for assessing the impacts of disturbance to non-breeding waterfowl*. Footprint Ecology, unpublished report for Natural England.
- RPS. (2014). *New Forest National Park breeding wader survey* [Unpublished report for the New Forest National Park Authority].
- Sandifer, P. A., Sutton-Grier, A. E., & Ward, B. P. (2015). Exploring connections among nature, biodiversity, ecosystem services, and human health and well-being: Opportunities to enhance health and biodiversity conservation. *Ecosystem Services*, 12, 1–15. doi: 10.1016/j.ecoser.2014.12.007

- Schmitt, C., Oetken, M., Dittberner, O., Wagner, M., & Oehlmann, J. (2008). Endocrine modulation and toxic effects of two commonly used UV screens on the aquatic invertebrates *Potamopyrgus antipodarum* and *Lumbriculus variegatus*. *Environmental Pollution*, 152(2), 322–329. doi: 10.1016/j.envpol.2007.06.031
- Sharp, J., Lowen, J., & Liley, D. (2008). *Changing patterns of visitor numbers within the New Forest National Park, with particular reference to the New Forest SPA* [Footprint Ecology / New Forest National Park Authority].
- Showler, D. (2010). *What is the impact of public access on the breeding success of ground-nesting and cliff-nesting birds* (Systematic Review; Completed Review Report No. CEE 05-10). Retrieved from Collaboration for Environmental Evidence, Bangor University website: <http://www.environmentalevidence.org/Documents/SR16.pdf>
- Smith-Castro, J. R., & Rodewald, A. D. (2010). Behavioral responses of nesting birds to human disturbance along recreational trails. *Journal of Field Ornithology*, 81(2), 130–138. doi: 10.1111/j.1557-9263.2010.00270.x
- Steven, R., Pickering, C., & Guy Castley, J. (2011). A review of the impacts of nature based recreation on birds. *Journal of Environmental Management*, 92(10), 2287–2294. doi: 10.1016/j.jenvman.2011.05.005
- Tantram, D., Boobyer, M., & Kirby, J. (1999). *Monitoring heathland fires in Dorset: Phase 2*. Northampton: Report to DETR.
- Taylor, E. C., Green, R. E., & Perrins, J. (2007). Stone-curlews *Burhinus oedicnemus* and recreational disturbance: developing a management tool for access. *Ibis*, 149, 37–44. doi: 10.1111/j.1474-919X.2007.00645.x
- The Land Trust. (2018). *The Economic Value of Greenspaces*. The Land Trust.
- Thiel, D., Jenni-Eiermann, S., Palme, R., & Jenni, L. (2011). Winter tourism increases stress hormone levels in the Capercaillie *Tetrao urogallus*. *Ibis*, 153(1), 122–133. doi: 10.1111/j.1474-919X.2010.01083.x
- Thomas, K., Kvitek, R. G., & Bretz, C. (2003). Effects of human activity on the foraging behavior of sanderlings *Calidris alba*. *Biological Conservation*, 109(1), 67–71. doi: 10.1016/S0006-3207(02)00137-4
- Tubbs, C. R. (2001). *The New Forest: History, Ecology and Conservation*. Lyndhurst, Hampshire: New Forest Ninth Centenary Trust, New Forest Museum.
- Underhill-Day, J. C. (2005). *A literature review of urban effects on lowland heaths and their wildlife*. Retrieved from English Nature website: [internal-pdf://EN RR 623, John Day literature review of urban effects-3794804480/EN RR 623, John Day literature review of urban effects.pdf](internal-pdf://EN%20RR%20623,%20John%20Day%20literature%20review%20of%20urban%20effects-3794804480/EN%20RR%20623,%20John%20Day%20literature%20review%20of%20urban%20effects.pdf)

New Forest SAC/SPA/Ramsar: Impacts of
recreation and potential mitigation approaches

- Whitfield, D. P., Ruddock, M., & Bullman, R. (2008). Expert opinion as a tool for quantifying bird tolerance to human disturbance. *Biological Conservation*, 141(11), 2708–2717.
- Williams, D. R., Child, M. F., Dicks, L. V., Ockendon, N., Pople, R. G., Showler, D. A., ... Sutherland, W. J. (2019a). Raise awareness amongst the general public through campaigns and public information. In *What works in Conservation*. Retrieved from <https://www.conservationevidence.com/actions/309>
- Williams, D. R., Child, M. F., Dicks, L. V., Ockendon, N., Pople, R. G., Showler, D. A., ... Sutherland, W. J. (2019b). Use signs and access restrictions to reduce disturbance at nest sites. In *What works in Conservation*. Retrieved from <https://www.conservationevidence.com/actions/309>
- Wright, R. N., & Westerhoff, D. V. (2001). *New Forest SAC management plan*. Lyndhurst: English Nature.
- Wynn, R., & Page, A. (2018). *New Forest Curlew Project: 2018 Results*.

Appendix 1: Selected SSSI condition commentary

Selected condition assessments by unit for the New Forest SSSI. Units with commentary on recreation issues (or possibly relating to recreation) have been selected and the comments text has been cut so that the focus is on recreation issues. Condition: F=favourable, UR=unfavourable recovering, UD=unfavourable declining,

Unit no.	Name	Condition	Comment (selectively cut to focus on commentary relating to recreation impacts)
032	Deadmans Bottom	UR	This area is mostly occupied by humid heath and mire. The heath habitat is generally in good condition but the comparatively small areas of mire are currently in poor condition. The two small areas of mire have indications of adverse impacts arising from disturbance and excessive heavy poaching. There are extensive areas of open standing water and bare peat resulting in fragmentation of the habitat. However, patches of good quality vegetation persist in places with characteristic plants such as white beak-sedge. The area includes a water course with tall swamp vegetation and with occasional bog myrtle. Means of reducing adverse impacts on the areas of mire are being investigated.
033	Millersford Bottom Mires	UR	...There are also several areas of species-rich mire. These have areas of erosion and damage as a result of excessive poaching. There are also indications of adverse impacts arising from artificial drainage, possibly causing a reduction in extent of the habitat. However, areas of good quality mire vegetation are present and these have good representation of characteristic plants such as white beak-sedge.
072	Brook Golf Course	F	This area is managed as a golf course although it is continuous with the rest of the open Forest and is grazed by free-roaming stock...There are no indications of negative impacts arising from nutrient input, non-native species or disturbance except for an area of heavily poached ground adjacent to a farm boundary on the 1st fairway in the east of the unit. This is about 0.5 ha in size and has frequent weedy plants such as annual meadow grass, knotgrass and broadleaved plantain. The extent of the area should be monitored to ensure that it is not expanding.
146	Bramshaw Commons - Dry	F	This is a large complex with a variety of habitats including dry heath, acid grassland, Molinia lawn and mire. The complex is separated from the remainder of the New Forest but the whole area is grazed. The habitats are for the most part in good condition although there are issues of concern. In particular, cover of gorse and scrub is high in parts, and there is localised ground damage arising from excessive trampling and vehicle movements. Measures have been put in place to address these issues.
147	Halfmoon Mire	F	...There is some damage to vegetation by vehicle movements but this is localised....
174	Langley Wood, Deerleap	F Unit adjacent to the road and car park, resulting in scattered litter.

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

Unit no.	Name	Condition	Comment (selectively cut to focus on commentary relating to recreation impacts)
249	Mockbeggar Verges	UD	<p>The verges and occasional larger areas of grassland comprising the unit are best described as semi improved, close grazed and frequently used for parking, causing areas of bare ground along most of the roadsides. The interest is in the chamomile which is frequent throughout and the populations of small fleabane that in 2014 were much reduced compared to a survey carried out in 2012. In many places brambles and scrub are encroaching further reducing extent of open grassland. There are 2 ephemeral ponds that have been colonised by invasive non-native species such as <i>Crassula helmsii</i>, still dominant, and parrots feather although this was not evident in 2014. Also a number of ditches that also have monkey flower at least along the road to Mockbeggar Farm.</p> <p>Solutions to eradicate <i>Crassula helmsii</i> in other parts of the forest have not been successful and the presence of this species is under consideration. The reduction in numbers of small fleabane is of concern and in one particular spot opposite the garage where large numbers were recorded in the past, despite or perhaps because of frequent parking, none were found. In this location barriers to prevent parking have been installed and this may be a reason for the population crash. A reduction in livestock grazing through the village has reduced the level of poaching of the verges which is the probable cause of lower numbers of small fleabane recorded in all other previous locations as well. Increasing use of hogging for informal parking continues to be on the increase despite information campaigns by the local Parish Council, further reducing extent. Unit remains unfavourable declining.</p>
262	Royal Oak Gorley	UD	<p>Linear unit of settlement lawn with a road running through. The Royal Oak pub uses the area adjacent for parking. Bare ground in relation to parking and over-running verges makes this unit unfavourable. Need to address the parking issue through the HLS agreement with Somerley.</p>
273	Hatchett Green	F	<p>This unit covers the village green (with cricket pitch) as well as an area of woodland edge community behind the school and an area of grassland to the south west of the green. The green is used by the school for PE and recreation, and grazed by commoners' stock (mostly ponies). The acid grassland has a good proportion of herbs (average of 47%), such as Cat's-ear (<i>Hypochaeris radicata</i>), Hawkbit species (<i>Leontodon</i> spp), Mouse-ear hawkweed (<i>Pilosella officinarum</i>), Sheep's sorrel (<i>Rumex acetosella</i>) and Buck's-horn plantain (<i>Plantago coronopus</i>). It is also important for the presence of Upright Chickweed (<i>Moenchia erecta</i>) which was found occasionally across the unit. On parts of the green in front of the school, there are patches of bare ground with low species diversity due to high usage. As long as these do not spread, the bare ground is within target over the unit as whole.</p>
341	Ma 5 Wet	UR	<p>....There are no indications of negative impacts arising from nutrient input, excessive disturbance or trampling and current grazing levels appear appropriate to maintain the habitats in good condition. There are occasional areas where recreational and grazing pressure are causing erosion but these are minimal and not increasing in scale.</p>

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

Unit no.	Name	Condition	Comment (selectively cut to focus on commentary relating to recreation impacts)
343	Highland Water Mire	F	This is an area of wet heath, mire and bog woodland to the north of Bolderwood Inclosure. All of the habitats are in good condition with a wide range of characteristic plants present. The only note of concern is that there is localised disturbance of the mire vegetation where there is a pedestrian crossing and livestock damage but the impacts are localised.The erosion of the mire is confined to a small area in the upper reach and another place at the lower end where a footpath crosses. However, the overall extent of damage is relatively small. All other relevant designated interest features were also assessed.
348	Holm Hill Mire	UR	Unit has areas of degraded mire and straightened drainage channels that are naturally infilling with sphagnum and typical mire species of limited diversity, no negative indicators but not fully restored. Molinia meadow type grass dominated areas only on the road verges, these degraded, species poor and subject to vehicles and therefore not in a favourable condition. Small areas of degraded wet heath on the edges of larger areas of dry heath both with excessive bracken, trees and scrub including high numbers of seedlings and occasional rhododendron, no other negative indicators but not favourable....
369	Millyford Bridge Riverine Wood	F	.Only minor negative indicators including recreational damage near the car park at Highlands and none exceeding thresholds, remains Favourable.
374	Ma 6 Dry	F	A large unit comprising a number of scattered areas of dry habitats in the area East of Lyndhurst, typically the higher ground interspersed with wetter valleys and woodland of other units...The large area at Bolton's bench, adjacent to Lyndhurst, is predominantly dry acid grassland with various non-conservation features such as carparks, the grave yard, a cricket pitch, memorial, benches, the Park pale and a disused sand quarry. In this area recreation is particularly high and has long been noted as having a negative effect on the ground causing compaction leading to low diversity of the plant community and erosion of footpaths, this continues and with high numbers of dogs off leads may also be affecting breeding birds in the wider area. However the majority of the unit is more remote and meets all targets for the habitat types with surprisingly high occurrence of positive indicator species, a particularly species rich bracken stand occurs adjacent to Matley wood, but no negative indicators of any significance. The grazing is sufficiently heavy to maintain high diversity of the plant communities but in places, where natural bottlenecks occur, the passage of stock and recreational traffic has caused poaching. In these places can be found some of the New Forest rarities that benefit from bare ground such as Slender marsh-bedstraw, Allseed, Sand spurry, Marsh club moss and Chamomile along with others.....
449	Hatchet Pond	UD	One large pond dominates this unit with a surrounding fringe of species rich mire and wet heath mosaic, high levels of recreational disturbance have left much of the bank closest to the car park bare and compacted, there is an artificial embankment on the eastern edge. In this part there are few aquatic plants. The northern tip of the main pond is dominated by bog bean with Hampshire purslane and crassula and non native lilies. The presence of introduced fish is also a threat to the interest features and although no longer officially carried out appears to be a persistent problem...

New Forest SAC/SPA/Ramsar: Impacts of recreation and potential mitigation approaches

Unit no.	Name	Condition	Comment (selectively cut to focus on commentary relating to recreation impacts)
480	Balmer Lawn	F	The majority of the unit is open lawn with standard or scattered trees and shrubs in places especially to the South towards Jacks Wood; considered as site fabric, scrub has been reduced recently and all add structure. The area is the best example of the tussock mounds common throughout the New Forest and considered to be remnants of wet heath that are particularly dense in places here... In places there are indicators that recreational use is having a negative effect on diversity especially close to the campsite from trampling and BBQs...
529	Malborough Deeps	UR There is a small area of wet <i>Molinia</i> meadow in the South East that is currently little more than a wide ride due to the frequent willows that are collapsing into the open space. This in combination with the very wet ground has led to high levels of poaching and disturbance. There is a good range of positive indicator species of Molinia Meadow and no other negative indicators. The water course draining from the adjacent enclosure unit 538 appears to have been modified in the past but is naturalising well but past spoil banks are affecting the hydrology and exacerbating the poaching on the adjacent grassland. Unit remains unfavourable due to the high levels of poaching caused by the willows narrowing the main ride and high recreational use.
571	Hollands Wood Campsite	UD	This area of extensively grazed broadleaved woodland is largely occupied by a heavily used campsite with associated toilet, waste disposal & kitchen facilities provided on site. The whole area is subject to very high visitor pressure and high levels of trampling, removal of dead wood and disturbance of wildlife. There are numerous indications of damaging impacts on the special interest features. The nature conservation value of the area is consequently low. The canopy of the woodland is predominantly mature oak. There are few signs of young trees or natural regeneration despite the open canopy. There are also a large number of mature birch. There is very little dead wood present. The understory is poorly developed and consists of widely scattered willow, hawthorn and holly. The ground layer has widely spaced patches of bramble and bracken but is otherwise dominated by grasses tolerant of heavy trampling and ruderal species. There are very few nectar sources. The majority of the area is subject to heavy trampling and compaction, and there is a lot of bare ground. The ground vegetation in the open areas is heavily modified and has few of the species typically associated with New Forest lawns or acid grassland. In addition to the above, all additional designated features have been considered and assessed.